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Ontario
Energy
Board

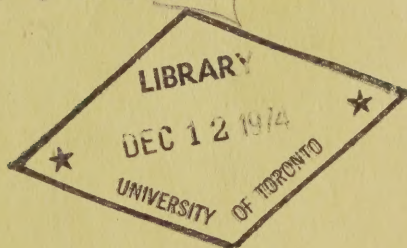
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Report to the

Minister of Energy

[ONTARIO HYDRO
POWER SYSTEM EXPANSION PROGRAM
AND
FINANCIAL POLICIES]



August 1974



Ontario
Energy
Board



August 26, 1974

Honourable W. Darcy McKeough
Minister of Energy
Government of Ontario
Queen's Park
TORONTO, Ontario

Dear Mr. Minister:

On November 5th, 1973, in accordance with Section 37a of The Ontario Energy Board Act, you referred to the Board for investigation and examination and report, certain matters affecting or related to rates or charges of Ontario Hydro, namely:

1. The policies and practices respecting expansion of the Ontario Hydro power system, including the Generation Development Program for the period 1977-1982, which was approved in principle by the Government of Ontario in June 1973, subject to review;

and

2. The financial policies of Ontario Hydro, together with financial objectives.

The reference specified that with respect to power system expansion, priority should be given to the investigation of the Generation Development Program for the period 1977-1982, including a review of the following factors:

- (a) The load forecast

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- (b) Planning the new generation and bulk transmission facilities:
 - system reliability
 - interconnections and power pooling
 - economic analyses governing investment decisions
 - fuel and heavy water supplies, and
 - operation and maintenance considerations.
- (c) The program for new generation and bulk transmission.

On November 13th, 1973, the Board made an Order providing for:

- a. the separation of the hearing into two phases, Phase I (to deal with power system expansion) commencing January 21st, 1974, and Phase II (to deal with financial policies), commencing at a later date;
- b. the pre-filing and making available to the public, by December 20th, 1973, of Ontario Hydro's submission of evidence on power system expansion;
- c. the pre-filing and making available to the public at a date to be named later, of Ontario Hydro's submission of evidence on financial policies;
- d. the filing of notices of intention, by December 14th, 1973, by persons wishing to make submissions to the Board;
- e. the publication of a Notice of Hearing informing the public of the matters dealt with in the Order.

Following publication of the Notice of Hearing in November, 1973, the Board received notices of intention to make submissions within, or shortly after, the time allowed for giving such notice, from:

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Minister of Energy

Ontario Municipal Electric Association
The Consumers' Gas Company
Niagara Basic Power Users Committee
Pollution Probe
Sierra Club
Carl T. Rose
C. K. Kalevar
Others who subsequently withdrew.

The hearing, which was held in Toronto, commenced as planned on January 21st, 1974, with a review of power system expansion, described as Phase I of the hearing. Ontario Hydro's submission of evidence on financial policies was pre-filed and made available to the public on February 28th, 1974, and Phase II of the hearing, dealing with these matters, commenced on April 1st, 1974. An additional notice of hearing was published to inform the public of the commencement of Phase II of the hearing and of the availability of Ontario Hydro's pre-filed submission of evidence on financial policies. The hearing ended after 58 sessions on June 3rd, 1974.

The hearing was conducted by a panel of three members of the Ontario Energy Board, namely:

A. B. Jackson, Q.C., panel chairman,
W. W. Stevenson, Ph.D., and
A. J. G. Leighton, P.Eng.

Counsel for the Board were R. W. Macaulay, Q.C., and, as occasion required, D. H. Rogers.

The Board and its counsel were assisted, in preparing for the hearing and analyzing the evidence and argument put before the Board, by an advisory group of experts comprising both staff members and outside consultants. Board Counsel with the help of the Board's advisory group of experts, conducted a thorough and effective cross-examination of the witnesses in order to present to the public and to the Board an adequate record of relevant information.

Honourable W. Darcy McKeough
Minister of Energy

The persons making submissions to the Board did so in various ways. The Ontario Municipal Electric Association (OMEA), an association of the municipal retailers of electricity who purchase most of the electricity generated by Ontario Hydro, was represented throughout the hearing and took an active part in questioning Hydro's witnesses, presenting evidence and presenting argument. The Niagara Basic Power Users Committee (NBPUC), a group of very large industrial customers in and around Niagara Falls served directly by Ontario Hydro, kept in touch with the progress of the hearing but did not submit evidence of its own. It did, however, submit its views and proposals as argument. The persons other than the OMEA and the NBPUC, not being representative of customers of Ontario Hydro, had a somewhat different area of interest. The Consumers' Gas Company was interested as a competitor in the energy supply field; it kept in close touch with the course of the hearing but did not present evidence or argument. Pollution Probe, the Sierra Club, Mr. Rose and Mr. Kalevar were especially interested in the environmental aspects of the power system expansion program. Pollution Probe attended sessions that were of particular interest to it, conducted cross-examination and presented its views and proposals as argument. The Sierra Club attended some sessions and conducted cross-examination. Mr. C. T. Rose, of Thunder Bay, did not attend the hearing, but he reviewed the written submission of evidence of Ontario Hydro and made his own submission, which was received on the record as written argument. Mr. Kalevar, of Toronto, provided the Board with numerous publications on matters of environmental concern and, at an evening session held for his convenience, presented viva voce argument.

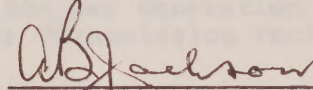
At a late stage of the hearing, Mr. Michael Cassidy, M.P.P., requested leave to intervene in order to have the Board undertake a review of certain aspects of Ontario Hydro's Arnprior hydro-electric generation project. This is a current project and was not part of the expansion program that was specifically referred to the Board for review. After hearing argument and after careful consideration, the Board decided that leave should not be granted.

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Minister of Energy

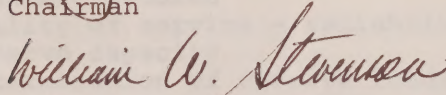
An Interim Report was made by the Board on May 22nd, 1974, to assist the Government in deciding which specific authorization might be given to Ontario Hydro to proceed with the construction of certain facilities. The final report is now respectfully submitted.

The members of the Ontario Energy Board panel as named above have agreed to this Report as presented, as witnessed by their respective signatures hereto.

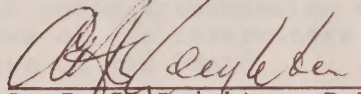
ONTARIO ENERGY BOARD




A. B. Jackson, Q.C.,
Chairman



W. W. Stevenson, Ph.D.,
Member



A. J. G. Leighton, P.Eng.,
Member



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Map of Ontario Hydro System



Legend

Main Sources of Power

HYDRO-ELECTRIC CONVERSION	HYDRO-ELECTRIC CAPACITY IN MEGAWATTS
	over 500,000
	100,000-500,000
	10,000-100,000
	under 10,000

GENERATING STATIONS UNDER CONSTRUCTION

	OR BEING EXTENDED

ROUTES OF MAIN POWER FLOW

POINTS OF POWER INTERCHANGE

MAIN UTILIZATION CENTRES

Regions

①	Western
②	Niagara
③	Central
④	Georgian Bay
⑤	Eastern
⑥	Northeastern
⑦	Northwestern

REGIONAL BOUNDARIES



PART 1

POWER SYSTEM EXPANSION

ONTARIO HYDRO IN PERSPECTIVE

Ontario Hydro, known until recently as The Hydro-Electric Power Commission of Ontario, is a self-sustaining public enterprise with broad powers with respect to electricity supply throughout Ontario. Its authority is derived from legislation passed by the Ontario legislature in 1906 to give effect to recommendations of earlier advisory commissions that the water powers of Ontario should be conserved and developed for the benefit of the people of the Province. The legislation has been amended from time to time and now appears as The Power Corporation Act, R.S.O. chapter 354, as amended by 1972, c.1, s.73 and 1973, c.57.

Ontario Hydro is the largest electric utility in Canada and one of the largest in the world. As of December 1973 it owned fixed assets valued at some \$6 billion, had annual revenues in the order of \$700 million, and operated a province-wide generation and transmission system of some 17,500 megawatts capacity.

Primarily a bulk power supplier, Ontario Hydro sells power at wholesale to 353 municipal electric utilities and about 90 direct and generally industrial customers. These latter customers are supplied directly from Ontario Hydro's system and each has an average annual power demand in excess of 5000 kilowatts.

Chapter 1 Continued

At the retail level, Ontario Hydro supplies power to some 700,000 customers through its own province-wide rural system and 13 separately classified local systems in Northern Ontario.

On the basis of average monthly peak demand, the municipalities account for 70 per cent of Ontario Hydro's total; the direct customers 15 per cent and the rural and local systems the remaining 15 per cent.

For many years, the northwestern part of Ontario was isolated electrically from the rest of the province and the total system was generally considered in terms of two major components, the East and West Systems. In 1970, the two were interconnected by a 230 kilovolt transmission line with a capacity of approximately 300 megawatts. As the limited capacity of the tie results in certain operating constraints, the two systems continue to be viewed by Hydro for planning purposes as separate entities, although credit is given to the interconnection for the transfer of reserve capacity. The West System comprises only six per cent of the total and hence is of relatively minor importance.

In addition to the internal east-west interconnection, the Ontario Hydro system is connected electrically to neighbouring utilities in Quebec, Manitoba, New York and

Michigan. Through these interconnections, the Hydro system is effectively part of a vast electrical network involving most of North America.

Ontario Hydro maintains its central offices in Toronto; however, for administrative flexibility and customer contact, the Province of Ontario is divided into seven regions, each administered from a regional office. The West system comprises one of these regions, namely the Northwestern Region, with headquarters at Thunder Bay.

Over most of its 68 year history, Ontario Hydro has relied on water power for its generation requirements. In recent years, having harnessed the bulk of the economic water power potential available in the Province, Hydro has had to turn to thermally generated power to supply an increasing portion of its requirements. Hydro now has in operation and under construction large central generating stations fuelled by coal, oil and uranium. As of 1973, water power accounted for some 47 per cent of Ontario Hydro's energy requirements. By the end of 1982, Hydro's projection for the hydroelectric component shows a decline to 21 per cent of total energy production.

The rate of growth of Hydro's peak demand has followed the general trend of North American utilities,

compounding at about 7 per cent per annum or doubling in size each decade. Lead times required to place new generation in service are lengthening and are currently in the order of 7-10 years. These require very early commitment to project design and financing based on forecasts of loads and other factors which extend further into the future than ever before and consequently are subject to less accurate definition. For instance, rapid escalation of construction costs has given rise to serious concern on the part of Hydro regarding financing of the facilities required to meet future loads.

Chapter 1 continued

The generation expansion program presented by Ontario Hydro to the Ontario Energy Board for the period 1977 to 1982 is basically as follows:

<u>Facility</u>	<u>In Service Date</u>		<u>Capital Cost (\$million)</u>
	<u>First Unit</u>	<u>Last Unit</u>	
Pickering 'B' G.S. 4 - 500 MW units	1980	1982	1,251
Bruce 'B' G.S. 4 - 750 MW units	1981	1983	1,904
Bowmanville G.S. 4 - 750 MW units	1982	1984	2,107
Wesleyville G.S. 4 - 500 MW units	1979	1980	672
Thunder Bay G.S. 2 - 150 MW units	1979	1980	171
West System G.S. 2 - 200 MW units	1981	1982	263
Bruce Heavy Water Plants B, C & D			1,071
Sub-Total			7,439
Transmission and Distribution			1,283
TOTAL			8,722

Note:

1. For certain projects, the construction period and hence the capital expenditure extends beyond the program period 1977-1982.

2. All cost estimates except that for transmission and distribution are based on November 1973 escalation forecasts and March 1974 interest rate forecasts. The cost estimate for transmission and distribution is based on the November 1973 escalation forecast and an interest rate of eight per cent.

In addition to the foregoing program, certain other work of a preparatory nature was also presented as part of the program.

This basic program received approval in principle from the Government of Ontario in June 1973, subject to review by the Ontario Energy Board.

THE LOAD FORECAST

2.1 The Load Forecasting Process

Ontario Hydro prepares and regularly updates a series of short- and long-range forecasts which provide estimates as to the amounts of energy and capacity which its customers will demand. Forecasts are prepared by the load forecasting unit which is headed by a professional economist. Technical and statistical support to the Unit is provided by other sections of Hydro's Power Market Analysis group.

In preparing and updating the various load forecasts the load forecasting unit makes extensive use of the knowledge of Hydro personnel in the seven regional offices who are in direct contact with Hydro's customers. The basic data received from or verified by the regions is compiled using computerized statistical techniques and incorporating various factors relating to interruptible power contracts, line losses and system diversity as well as judgmental corrections relating to economic, demographic and other factors.

The basic load data are aggregated in various combinations to produce forecasts of power and energy demand

binations to produce forecasts of power and energy demand by total system, by region and by customer class. The forecasts are prepared on a "most probable" basis which means that an equal probability exists that the forecast will be too high or too low.

Of the several forecasts prepared, those for the Ontario Primary Demand and Ontario Firm Demand are of greatest significance. The two differ by the amount allowed for interruptible load which is excluded from the forecast of Ontario Firm Demand. It is this latter forecast that serves as the basis for generation and transmission planning.

The forecast of Ontario Firm Demand may include an allowance for unallocated load; specific loads which Hydro considers will likely develop during the forecast period but the timing, location and size of which cannot be predicted with certainty. In addition, the forecast may incorporate a "target load allowance" in recognition of possible errors in the forecast and the probable unavailability of generation due to forced outages. Hydro has not included a target load allowance in its forecasts since 1971.

These forecasts are reviewed by an inter-departmental committee following which an annual load and capacity

report is published. This report provides both short- and long-range estimates of requirements and indicates the resources available to meet them. The report also contains a general economic perspective as it affects the forecast. It is widely circulated within the Hydro organization, but is not subject to formal Board approval. It forms the basis for financial, engineering and operational planning.

2.2 Forecast Demands

Hydro's forecast of Ontario primary demand to 1982, as set forth in its 1973 Load and Capacity Report, is tabulated below.

<u>Year</u>	<u>December Peak Demand</u>	<u>Annual Energy</u>	
	Megawatts	Megawatt-hours	Average Megawatts
1974	14,699	84,851,970	9,686.3
1975	15,848	91,642,740	10,461.5
1976	16,926	98,824,392	11,250.5
1977	18,090	105,459,012	12,038.7
1978	19,325	112,870,848	12,884.8
1979	20,658	120,667,248	13,774.8
1980	22,084	129,361,968	14,727.0
1981	23,608	137,855,244	15,736.9
1982	25,238	147,354,588	16,821.3

2.3 Views of the Intervenors

The Ontario Municipal Electric Association testified that it endorses the load forecasting methodology employed by Ontario Hydro. The Association predicted that

the combined effects on growth of electrical demand of environmental and conservation pressures would be largely offsetting, with probabilities effecting, if anything, a net increase in demand. Although not significant at present, in future it may become necessary to recognize this increase in the load forecast.

The Association believes that the demand and energy components of the forecast must be distinguished and kept separate. It considers that Ontario Hydro's wholesale customers, and Hydro too, can influence, the requirement for energy. However, they can do little to alter or restrict the demand without increasing costs and changing life styles. This latter consideration is viewed by the Association as being beyond the prerogative of an operating utility and more properly the responsibility of government.

Pollution Probe was concerned that Hydro is passively accepting exponential growth, which Probe considers most undesirable, and that the load forecast reflects this philosophy. Probe urged conservation and a dampening of demand and a presentation of demand projections reflecting conservation policies.

The Sierra Club expressed views similar to those of

Pollution Probe in respect of what it considered to be Hydro's past acceptance of doubling of load every decade.

Mr. Kalevar indicated his opposition to exponential growth and cited numerous published articles supporting the need for energy conservation on a global basis. He advocated improved utilization of existing facilities including the productive use of waste heat from thermal and nuclear generating stations.

The Niagara Basic Power Users Committee argued that the marketing and pricing policies of Hydro can and should promote conservation and economic utilization of electric energy. The NBPUC submitted that it is no longer expedient for Hydro or Government to adopt the attitude that consumption or cost cannot be controlled. The Committee further pointed out that the load forecast is a reflection of past trends and that little consideration has been given to the risks inherent in the demand being lower than forecast. The Committee argued that in light of the uncertainties that Hydro itself assigns to the load forecast, Hydro should evaluate more carefully the consequences of excess investment that would occur should the demand fail to materialize.

Mr. C. T. Rose expressed dissatisfaction with the apparent lack of consideration of conservation in Hydro's load forecast and urged more efficiency in the use of energy resources.

2.4 Views of the Board

The Board is of the opinion that the load forecasting methodology employed by Ontario Hydro is basically sound and has produced results on which Hydro can reasonably rely. The historical record of Hydro in load forecasting is excellent, Hydro's forecasts having consistently proved to be much more accurate than the average experience of U.S. utilities. However, the Board considers that in view of the current structural changes now occurring in energy markets, the process can be augmented and improved.

Because of the increasing importance of load forecasts as they affect long-range commitments to extremely large capital requirements, the Board is of the opinion that it would be appropriate for all load forecasts and revisions thereto to be subject to the formal approval of the Hydro Board before being used as the basis for planning by the Hydro staff. A semi-annual submission on the current trends in the forecasts should also be provided to the Hydro Board and the staff.

The Board considers that good load forecasting by Hydro is vital to the provincial interest. Notwithstanding good past performance, more advanced forecasting techniques will be required in the future. An elevation in the status of the load forecasting unit is indicated.

The Board considers that the efficient utilization and conservation of electric energy is important. Accordingly, the Board is of the opinion that Hydro should accelerate, as a matter of urgent priority, a comprehensive program of encouraging the efficient utilization and conservation of electric energy. The expected results should be reflected in the load forecasts in future as and when they can be assessed with reasonable confidence.

The Board considers that a greater socio-economic input into the load forecasting process is desirable and would result in a more comprehensive Load and Capacity Report. This report should contain an expanded review of economic, business and social trends and their probable effects on demand, resources and pricing policies. The Board observes that the socio-economic commentary presently included in the report is directed primarily towards the load or demand situation. The Board is of the opinion that the value of the report to the senior

management of Hydro would be enhanced if, in addition to the demand issue, the consideration of the likely future economic, business and social climate were related more to the policies governing the provision of resources and establishment of prices. Hydro should also maintain and make available, as required for load-forecasting purposes, basic economic data concerning the likely influence of changing relative energy prices on the various sectors of the provincial economy and the market shares of the various energy suppliers. The Board also recommends that the load forecasting unit should have a specific involvement in the rate-making processes of Ontario Hydro.

PLANNING THE NEW GENERATION AND BULK POWER
TRANSMISSION FACILITIES

3.1 The Power System Planning Process

The forecast of peak power and energy demand serves as the basis for determining the nature, extent and timing of the generation, transmission and distribution facilities that must be added to the system to satisfy the anticipated requirements. The process of facilities planning is largely the development of alternative system expansion plans or programs. The different programs reflect variations possible in the type, size, characteristics and location of generating plant; capacity, voltage level and routing of principal transmission lines; and the rating and location of major transformer and switching stations. Estimates of capital and operating costs are prepared for the more likely alternatives. The technical and economic merits of the various programs are compared and judgments made regarding their relative attractiveness. By continued refinement of the technical-economic studies, the program that most nearly satisfies the requirements of the system will evolve. The selected program may or may not be close to the optimum depending on the depth and accuracy of the studies and on the astuteness of the engineering-economic judgements that inevitably must be made.

In Ontario Hydro, the responsibility for the development of the system expansion programs is assigned to the System Planning Division, one of the organizational groups reporting to the Chief Engineer. Information essential for the economic analysis, such as interest and discount rates, capital availability and cost escalation is provided by the Finance Branch. Inputs from the Operating Division concern operating suitability, maintainability, staffing requirements and operation and maintenance costs of possible future installations.

Once a program is selected, it is submitted to the Hydro Board for approval and thereafter serves as the basis for subsequent engineering, construction, procurement and financing.

3.2 Economic Studies

In explaining the rationale underlying its approach to the economic analyses of alternative sources of generation, Hydro contends that its total generation requirements can be classified into three categories. These are:

1. High capacity factor generation which operates at an annual capacity factor of 60 per cent or greater.

2. Intermediate capacity factor generation which operates at an annual capacity factor of between 10 and 60 per cent.
3. Low capacity factor plant which operates at an annual capacity factor of less than 10 per cent.

High capacity factor generation comprises about 50 per cent of the total generation required and produces some 75 per cent of the total electrical energy demand of the system. Intermediate capacity factor plant represents about 30 per cent of the generation and supplies most of the remaining 25 per cent of the energy production. The low capacity factor plant, peaking capacity, constitutes the remaining 20 per cent of the installed generating capacity but provides little energy.

Hydro also contends that the five economic studies contained in its submission plus the three additional studies filed subsequently must be viewed in relation to the foregoing generation requirements. In order to facilitate this appreciation, Hydro divides the economic studies into five groups as follows:

Group 1 Studies applicable to the East system which deal with possible alternatives for high capacity factor generation. Consideration is given

in these studies to the relative economics of fossil and nuclear generation.

Group 2 Studies similar to those of Group 1 but applicable to the West System.

Group 3 Studies which compare the economics of generating units of different sizes but of the same type, i.e., fossil/fossil or nuclear/nuclear.

Group 4 Studies of specific development plans for the West System.

Group 5 Exploratory studies undertaken to determine if further more detailed investigation is necessary.

Given the relationship between generation requirements and annual capacity factor, it is the view of Hydro that the provision of high capacity factor plant represents the most significant supply or resource problem and that the choice of plant for this type of service is limited to either fossil- or CANDU nuclear-fuelled thermal generation. Hydro argues that under conditions of high capacity factor operation, the economic choice between nuclear and fossil plant is relatively simple, and that the economic studies included in Group 1 clearly demonstrate that, for the East

System, nuclear plant is the more favourable at capacity factors exceeding 70 per cent. Hydro adds that if consideration is given to environmental issues arising out of the extensive use of fossil fuels, as well as the future availability, security of supply and price of such fuels, the choice becomes even more evident. Similarly, Hydro maintains that the Group 2 studies illustrate that at high capacity factors 200 megawatt CANDU units have some possibility of being economic on the West System. Hydro considers that the principal question to be answered by the economic studies is the composition of the total generation mix, i.e., the proportional relationship between nuclear and fossil generation over a program period, rather than whether a particular future generating plant should be nuclear or fossil fired.

With respect to intermediate capacity factor generation, Hydro points out that the program proposed for the period 1977 to 1982 does allow for the installation of some fossil fired generation to fulfill this function. It is Hydro's current opinion that after 1982 approximately two-thirds of the future generation will be nuclear and one-third fossil-fuelled plants. Thus, the mix of nuclear and fossil-fuelled plants added during the 1977 to 1982 program and thereafter will be such as to permit operation throughout their respective economic lives at capacity factors most favourable to each.

Peaking capacity or low capacity factor plants could be provided by combustion turbines and pumped storage generating facilities.

In response to criticisms regarding the treatment in the economic studies of capital, operation and maintenance, administration, and fuel costs, Hydro submitted that a more precise evaluation of such cost factors would not alter substantially the final result and ultimate choice of plant.

On the matter of variations in plant efficiency with capacity factor, Hydro considers that this point is not important in relation to the program under consideration but that greater attention may have to be given to this factor in studying nuclear installations subsequent to 1982.

The discount rates adopted by Hydro for purposes of economic analysis were questioned on the grounds that a more capital intensive nuclear generation program might lead to higher interest rates for Hydro borrowings. It was suggested that, for purposes of economic comparison, nuclear generating facilities might carry some slight interest rate penalty, to reflect this possibility. Hydro's position on this point is to recognize the possibility but to make no allowance because of lack of reliable estimates regarding

trends in future interest rates, as they relate to capital availability.

A further observation regarding the methodology of economic analysis employed by Hydro deals with system reliability and forced outage rates. It was noted that the forced outage rates of nuclear generating plants were not increased in future years to allow for increased outages resulting from nuclear stations having to follow load. Hydro states that forecast forced outage rates for future nuclear generation are, in fact, higher than those actually obtained at Pickering and further that nuclear plants considered during the program period will not be required to follow wide variations in load. Therefore, to increase outage rates because of load following requirements would be an erroneous procedure.

In 1961, Ontario Hydro issued a manual of economic studies in which guideline principles for economic analyses were set forth. This manual has been under revision for several years but, up to the time of the hearing, the revised version had not been issued officially. It was pointed out during the hearing that the economic studies included in Hydro's Phase I submission did not follow in all respects the procedures recommended in the manual. It was Hydro's view that because of

changing circumstances, to follow procedures established in 1961 would be inappropriate. Hydro advised that the Finance Branch was aware of and had accepted departures by the System Planning Group from the procedures specified in the economics manual.

3.3 Quality of Service - Reliability

A major judgmental factor involved in the system planning process is the establishment of a quality of service objective. While the term quality of service can be considered as embracing a great many different features of electrical supply, it is generally accepted that the phrase applies to continuity or reliability of supply, limited variation in the voltage and frequency, and minimum personal hazard to both the user and the staff of the utility. The subjective nature of quality of service creates difficulties in the development of specific quantitative values which can be used as criteria on which to base the planning and design of the electrical system. Some utilities have endeavoured to establish a monetary value of differences in service quality as viewed by the consumer. However, there has not yet been developed a satisfactory method of service quality evaluation which has been generally accepted by the electric utility industry.

In Ontario, a high quality of electric service has come to be accepted as policy by Ontario Hydro and little consideration has been given to providing service of a lesser standard, except in some rural areas. A high quality of service implies reliability of supply which, in turn, requires the provision of sufficient standby facilities to protect against unforeseen occurrences such as low water levels, equipment failure, maintenance shutdowns, storm damage and other events which might limit the production and transmission of electricity. The high level of reliability provided by Ontario Hydro is reflected at the generation level by the installation of reserve capacity and at the transmission level by the provision of additional transmission line and station capacity.

3.4 Reserve Capacity

As noted previously, an electric utility must maintain sufficient reserve capacity to ensure continuous supply. The determination of the amount of spare capacity needed for this purpose involves a complex technical assessment of such matters as the probability of low water levels at hydroelectric plants, the probability of failure of mechanical and electrical components of the system and the need for removing plant from service for maintenance.

One major factor influencing the amount of reserve capacity carried by a utility is the forced outage rates of units at existing and proposed generating plants.

Most major electric utility companies maintain detailed records of the operating status of their various generating units. Those instances when a unit is out of service because of some unexpected failure are classified as forced outages. The forced outage rate, expressed as a

percentage, is a measure of the time that a unit was out of service due to unexpected failure relative to the total time that the unit was operated during a given period. The total time on which the forced outage rate is based does not include those time periods when the unit was available for service but was not operated or those periods when the unit was unavailable because of overruns in the schedules for

planned and maintenance outages. The past performance of generating units of a particular type and size may be used to produce a forecast of future forced outage rates for similar classes of units. Thus, the historical records of past performance of the generating units

in a system reflect in the amount of the reserve capacity planned for the future.

Thermal unit forced outage rates experienced by Ontario Hydro in the past have been generally greater than the industry average as reported by the Edison

Electric Institute. This is due in part to Hydro's method of computing forced outage rates and in part to the poor performance of certain of its older thermal plants. Hydro's method of calculation of "equivalent forced outage rates" includes overruns in the time scheduled for routine and planned maintenance, a practice not common in the industry. Consequently, direct comparison with industry statistics is difficult.

In order to establish the amount of reserve capacity required on a system, it is first necessary to adopt a standard against which reliability can be measured. A widely used but approximate standard employed by North American electric utilities is that the system will fail to meet the load requirements imposed on it no more frequently than one day in ten years. This standard has been adopted by Ontario Hydro with some minor modification.

The combination of a high standard of reliability, coupled with the transition from a predominantly hydro-electric system of high dependability to the increasingly complex fossil-fired and nuclear generating stations requiring substantial amounts of time for equipment maintenance and repair, has required Ontario Hydro to increase significantly its generation reserve requirements.

As shown by the following tabulation of reserve capacity, Hydro forecasts that by 1982 the total installed generation on the East System will exceed the firm load on that system by about 28 per cent. This provides an average reserve which incorporates the very low margins required for the estimated 19 per cent of the East System capacity which will be hydraulic in 1982. Hydro evidence indicates that the incremental reserve required for new large thermal generation is in the order of 50 per cent.

Reserve Margins - East and West Systems

(per cent of firm load)

East System				West System			
<u>Year</u>	<u>% Reserve</u>	<u>Year</u>	<u>% Reserve</u>	<u>Year</u>	<u>% Reserve</u>	<u>Year</u>	<u>% Reserve</u>
1961	15.0	1972	16.8	1961	41.5	1972	27.2
1962	15.1	1973	33.0	1962	36.2	1973	39.6
1963	14.8	1974	30.2	1963	54.4	1974	33.6
1964	8.7	1975	27.3	1964	47.7	1975	25.7
1965	5.9	1976	36.0	1965	44.9	1976	19.7
1966	0.4	1977	31.5	1966	26.4	1977	15.9
1967	2.8	1978	27.6	1967	21.9	1978	18.0
1968	6.6	1979	29.1	1968	17.0	1979	27.3
1969	10.6	1980	28.0	1969	20.4	1980	21.3
1970	17.4	1981	28.4	1970	33.1	1981	33.5
1971	25.6	1982	28.1	1971	32.2	1982	27.2

It is appropriate to note that on the basis of past performance, Hydro has demonstrated that the financial burden that reserve capacity imposes on the system can be mitigated by the production of energy for sale on a short term basis to neighbouring systems in periods when the reserve capacity is not required for its primary purpose.

3.5 Determination of Reserve Levels

As noted previously, in order to determine the amount of reserve capacity needed to meet the standard, an assessment is made of a number of factors such as the likelihood of abnormally low flows at hydroelectric stations, the possibility of unexpected equipment malfunction as recognized by the forced outage rates adopted, and the forecast of maintenance requirements with respect to timing and duration. These data are then used to produce a mathematical model which relates the probabilities of outages to various amounts of generation. A second model is developed which equates the load to the probability of occurrence. The two models, generation and load, are combined to yield the probabilities of sufficient generation being available to satisfy various levels of load. By this means, it is possible to relate the probability of generation outage to the probability that the outage will occur at time of peak load. Thus, the amount of generation required to meet a given peak

load with a selected probability of success or standard of reliability can be determined. The excess of generation over peak load is essentially the reserve capacity margin.

3.6 Interconnection and Power Pooling

Virtually all major North American electric utilities are interconnected with their neighbours for mutual support. The various financial and technological aspects of interconnection have led to the creation of a number of power pools and other coordinating agencies embracing utilities with geographical proximity and compatible operational characteristics. These various entities have developed comprehensive inter-utility agreements involving such matters as standards of service, operating procedures and inter-utility billings for power exchanges or sales.

Ontario Hydro maintains substantial interconnections with neighbouring utilities in New York, Michigan, Manitoba and Quebec. Because of technical limitations, the latter facility is used primarily for the import of power. Due principally to the interconnection with New York State, Hydro is also a member of the Northeast Power Coordinating Council, a large power pool comprising most of the major utilities in the northeastern United States.

The assistance to be expected from neighbouring utilities will affect the reliability of each utility, regardless of the degree of assistance recognized in establishing its level of reserve generation capacity. It is the stated policy of Ontario Hydro to make no reduction in installed capacity because of possible emergency assistance from interconnections with other utilities.

3.7 Bulk Power Transmission System

The planning of Ontario Hydro's bulk power transmission system is based upon the dual requirements that the outputs of generators are to be transmitted to the loads in such a way that under normal circumstances, the maximum hour-by-hour economies of operation can be achieved while standards of system security are maintained.

The security standards used by Ontario Hydro are those adopted by the Northeast Power Coordinating Council, and relate to the survival of the system under various electrical fault and disturbance conditions.

Due to the considerably shorter lead times required for the construction of its transmission system as opposed to the construction of generating stations, the development of the transmission system follows the development

of the generation system in all phases except the determination of possible transmission line routings and types.

Because of the vast computational complexities involved, Ontario Hydro does not endeavour to plan an optimal transmission system, nor does it seek to plan the transmission system on a reliability basis similar to that used for the generation system. The size, type and timing of additions to the transmission systems are based on present worth calculations of capital cost, operating and maintenance costs, transmission system losses, and the cost of possible uneconomic operation of generation due to transmission system deficiencies limiting the transfer of generating capacity to the load centres.

3.8 Views of the Intervenors

The Niagara Basic Power Users Committee stressed the need for economic conservation and argued that Hydro was imprudent in embarking on a costly capital intensive program based on data which was incomplete and which did not reflect any conscious effort by Hydro to limit demand. It noted that Hydro's projected reserve requirements were excessive by North American standards, and that insufficient weight was placed on the value of interconnections. It questioned Hydro's reserve standards as arbitrary

and not supported by any recognizable cost/benefit analysis. It urged a more gradual transition to nuclear generation.

The Ontario Municipal Electric Association advocated a level of system reliability at least equal to that proposed by Hydro and pointed out the serious consequences to Hydro's municipal electric customers of any lessening of system performance standards. It endorsed the standard of reliability of 1 day in 10 years and the method by which Hydro assesses loss of load probability. It noted that in order to ensure that present standards of service are maintained, Hydro planning should be on the generous side.

Mr. Kalevar argued that current world conditions, particularly in respect of the energy shortage and the environmental concerns, required Hydro to assume a leading role in energy conservation. He stressed the need to adopt policies which would reduce the amount of facilities installed and advocated the use of less capital intensive, more efficient generating units. He questioned the need for Hydro's current high standards of service and reliability.

3.9 Views of The Board

In the opinion of the Board, the principal issue arising out of the consideration of the methods of economic analyses employed by Hydro relates to their use in determining the type of generation, nuclear or fossil-fuelled, to be installed for high capacity factor service. Hydro contends that nuclear generating plants of the CANDU type proposed for the program period, 1977 to 1982, and for some time thereafter, will operate at high capacity factors throughout their economic lives. Hydro maintains that economic studies of the type included in their Group 1 category (see Section 3.2) are adequate in that they demonstrate clearly that nuclear generation is more economic than fossil for operation at capacity factors greater than 50 per cent. Hydro argues that there is no need to apply more sophisticated techniques of economic analyses to establish the optimum mix of nuclear and fossil-fuelled generation.

The Board considers that the methods of economic analyses used by Hydro are simplifications of more traditional forms of analyses in which a system as a whole is simulated and its economic performance examined over a time period of sufficient length to ensure that current investment decisions are not affected by variations in the system expansion program after the chosen time period. The Board

recognizes that the methodology utilized by Hydro may result in the correct choice of generating plant for the current program. However, the Board is not convinced that Hydro has proven satisfactorily the equivalence between its approach and the more comprehensive methods of economic analyses by which alternative expansion plans are compared over longer time spans encompassing at least the economic lives of the facilities under review.

In the opinion of the Board, the validity of Hydro's studies depends largely on the assumption that nuclear generating plants installed in the near future will operate during their economic lifetimes at capacity factors exceeding 50 per cent. The Board questions whether it is reasonable to assume that nuclear generating plants of currently contemporary design can be expected to operate at a high capacity factor for a lifespan of 30 years or more. The Board is of the view that the future technological advancements in the design of CANDU type nuclear stations may very well follow the same general trends that characterized the development of fossil-fired generation, notably, better economies of scale, operating flexibility and thermal efficiencies. Ample evidence was submitted during the course of the hearing to indicate the extent of public concern regarding the amount of waste heat rejected to the environment from the once through cooling of large nuclear generating stations, spent

fuel disposal problems and radioactive releases. The Board considers it likely that public pressures will lead to improvements in CANDU technology which will result in a reduction in the lifetime capacity factors anticipated for stations of the Pickering and Bruce class. The Board observes that none of the studies submitted by Hydro indicated the probable impact on the economics of the proposed system expansion program or on the mix of generation comprising the program, of a significant departure from the critical assumption of high capacity factor operation.

The Board is concerned with what appears to be a lack of a consistent methodology in the various economic studies submitted by Hydro in support of its proposed program. The Board had difficulty in comparing the results of the several studies as each was based on different assumptions and none dealt with the overall system expansion program as proposed.

The Board notes that organizational changes which Hydro has recently effected or which it contemplates should facilitate the integration of technical, economic and financial planning essential for the proper evaluation of system expansion programs in their entirety.

On the matter of the economic manual, the Board recognizes

that large, complex economic studies cannot be undertaken strictly in accordance with textbook principles as set forth in a manual. Some judgmental licence must be permitted in the translation of such guidelines to real applications. Nevertheless, the Board considers that the production of the revised economic manual should be expedited.

The Board considers that in the future Hydro should obtain greater quantitative information on which to base a definitive corporate policy regarding the quality and reliability of electrical service. The Board is of the opinion that a research program should be funded immediately to determine the value to the customer of various levels of service and the effect that different service standards would have on the economics of system design.

The Board suggests that in the light of the cost of providing reserve generating capacity, it is not proper for Ontario Hydro to assign a zero value to the contribution of interconnections to generation reserve requirements. The Board considers that some value, however small, must be given to acknowledge the presence of such facilities. Partially for this reason the Board does not accept Hydro's stated reserve requirements and specific reference will be made to this subject in the views of the Board expressed in Chapter 7 of this report.

Because of the substantial effect which equipment performance has on system design and reserve requirements, the Board urges that Hydro institute an immediate and comprehensive performance upgrading review. An appropriate adjunct to this review would be the rendering of regular reports of unit performance to the Hydro Board. These should be on a basis affording a direct and true comparison with comparable equipment and components of equipment operated by other utilities. To this end a new and innovative type of inter-utility co-operative effort should be undertaken.

The Board notes that while the methodology adopted by Hydro in assessing the loss of load probability is used by other large utilities, it is approximate and subjective. The method provides an indication of the probability that an outage will occur due to unforeseen loss of generation but provides no measure of the magnitude of the loss or the duration or frequency of the occurrence. The technique applies to generation failures only and takes no account of transmission or distribution system malfunctions which may be the cause of a greater percentage of the total power failures as viewed by the ultimate consumer. Finally, the method does not incorporate any measure of the value of reliability, either from the point of view of consumer or the utility.

The Board considers that an intensive study of the entire subject should be initiated immediately by Ontario Hydro. The objective of such a study would be to establish the practical significance of the reliability index of one day in ten years, particularly as viewed from the customer's premises, and to develop a methodology that incorporates to whatever extent is possible and practical a value for reliable service, such value to be considered from the point of view of both the consumer and the utility.

FUEL SUPPLY

4.1 The Present Fuel Picture

Essential to Hydro's operating well-being is an assured supply of suitable fuel at competitive prices. The current world situation has complicated Hydro's fuel picture in two ways. Environmental constraints have greatly restricted the sources of fossil fuels which are available to Hydro and the cost of suitable fuels has escalated sharply while, at the same time, the security of supplies has decreased markedly.

In 1973 Hydro consumed about 7 million tons of coal, 49 billion cubic feet of natural gas, 2.4 million barrels of oil and 350 short tons of uranium for a total fuel bill of \$159 million. If the proposed generation expansion program is implemented, Hydro's annual requirements by 1982 will be 18 million tons of coal, 49 billion cubic feet of gas, 20 million barrels of oil and 1300 short tons of uranium fuel. In constant 1973 dollars, the annual fuel cost in 1982 will be 2.6 times the 1973 fuel cost.

Hydro's Supply Division is responsible for the procurement of fuel supplies. A Fuels Resources Engineer and

staff are responsible for the day-to-day monitoring of fuels and their sources and relating trends in fuel supply requirements to fuel availability and transportation economics. A recent announcement by Hydro has confirmed the creation of a Fuel and Supply Resources Development Division to cope with the urgent and complex issues associated with the acquisition and transportation of the primary fuels used in power generation.

Of all the fuels used by Hydro, only uranium is indigenous to the Province of Ontario except for some very small quantities of oil and gas. Uranium is, therefore, the only one whose security of supply is assured, subject, of course, to the appropriateness of action taken by the Government of Canada to protect domestic users of this energy resource.

Environmental constraints coupled with complex issues relating to the availability, transportation and storage of fossil fuels are causing concern to Hydro and have resulted in a considerable initiative to ensure that future requirements are met.

4.2 Fuels and Sources

COAL

Hydro anticipates that coal requirements will peak at about 18 million tons annually by 1978. Coal having a sulphur content sufficiently low to meet environmental standards is available in the Eastern United States, where it is in relatively short supply, and in Western Canada where it is plentiful. Supply from the latter is hampered by transportation difficulties and high charges.

Hydro has contracted for the purchase of 12 million tons of coal annually from the United States, and considers that the balance of its requirements can be met from the reserves of bituminous and sub-bituminous coal and lignite of Western Canada, although the characteristics of coal from these sources pose certain technical problems when used by Hydro in existing stations. Hydro is currently carrying out studies and tests to determine its future use of coal from Western Canada although it notes that the export of bituminous and sub-bituminous coal from Alberta is temporarily embargoed pending a review by that province.

Other potential coal sources are Nova Scotia and the Onakawana lignite deposits near James Bay.

An engineering report recently prepared for the Government of Ontario has established the basic feasibility of installing about 1000 MW of on site generation at Onakawana. However, a number of detailed technical, economic and environmental studies must be completed before any decision may be made to proceed with construction.

OIL

Hydro's planned commitment to oil-fired generating capacity is being limited because of declining oil reserves in Western Canada, rapidly escalating world oil prices, uncertainty of foreign supplies and environmental concerns. Although Hydro has contracted for half of its 1975-1979 requirements from a refinery in Eastern Canada, using offshore crude, it also envisages procurement of residual oil from Western Canadian crude refined in Ontario where additional refining capacity is now being planned. The availability of oil for up to 5000 megawatts oil-fired generating requirements is reasonably assured through the export policy of the National Energy Board which requires that domestic needs receive first priority.

NATURAL GAS

Although some of its generating units are currently capable of being fired by natural gas, mainly to meet environmental standards, Hydro considers that additional

supplies of gas will be limited and very costly and that these might be utilized to better advantage in uses other than boiler fuel. In view of this and because of problems associated with the delivery of additional supplies, Hydro does not anticipate any substantial increase of its present annual consumption of about 50 billion cubic feet.

URANIUM

Hydro has contracted for about half of its requirements of uranium fuel for nuclear generating plants to the year 1983 and is currently evaluating the best means whereby the balance of its long range requirements (1300 tons per year by 1982) can be met.

Ontario's potential production capability in 1976 is estimated to be 9,400 tons uranium oxide per year based on ore reserves of 190,000 tons at prices not exceeding \$10 per pound, which represents about 20 per cent of the equivalent category of reserves in the western world.

Uranium fuel is currently in good supply in Ontario but long range projections indicate a world shortage developing within five years, primarily because of the lack of sufficient current exploration and development

of new reserves. It takes up to 10 years to discover and delineate a new ore body and to achieve first production. It can be expected therefore that Canadian supplies will come increasingly under international price pressure and that action will have to be taken by Canada to ensure that priority is given to Canadian requirements. However, price is less important than the security of supply, since the price of uranium fuel plays only a minor role in the cost of electric energy generated by the CANDU system. For example, the CANDU reactor can produce electricity for seven mills per kilowatt hour with uranium costing \$6 a pound. If uranium costs \$50 a pound, the cost of electricity would increase only by two mills per kilowatt hour.

4.3 Views of the Intervenors

The OMEA commented on the vulnerability of Ontario Hydro in respect of the supply and price of fossil fuels, which must be secured outside the Province. It also noted the need to protect domestic supplies of uranium fuel in the long term.

The Sierra Club did not comment directly but suggested that the hazards of radioactive waste require more consideration when contemplating the use of uranium fuel.

Mr. C. T. Rose expressed concern about the environmental and public safety aspects of the use of nuclear fuels and the limited world reserves of uranium.

Mr. Kalevar expressed concern about the use of both fossil and nuclear fuels from a standpoint of environmental protection, efficiency and, in the case of nuclear fuels, safety.

4.4 Views of the Board

The Board notes the initiative of Hydro in its recent endeavours to ensure a secure supply of the various types of fuel required for its use. The recent creation of the Fuels and Supply Resources Development Division is deserving of mention. The Board considers that the newly created fuel supply unit should be charged with the responsibility of maintaining a watching brief on transportation methods and economics as they pertain to fuels.

The Board is of the opinion that the matter of future availability of suitable coal supplies from Western Canada should be pursued vigorously.

The Board notes that various arrangements are being considered by Hydro for the securing of future supplies of uranium oxide. In view of the heavy commitment proposed by Hydro to nuclear generation, the Board considers that this matter should receive the urgent attention of the Hydro Board. The Board recognizes the implication that the relative insensitivity of the cost of CANDU-produced electric energy to uranium supply prices should provide a moderating influence on the effects of future increases in fossil fuel prices on electric energy costs.

HEAVY WATER SUPPLIES

5.1 Heavy Water and the CANDU Reactor

The type of Canadian developed CANDU nuclear reactor used by Ontario Hydro utilizes deuterium oxide or heavy water both as a moderator and as a heat transport medium. Hydro has estimated that about one megagram or metric ton of heavy water is required to place in service 1 megawatt of electric generating capacity. During the proposed program period, the cost of heavy water inventory is expected to average about 15 per cent of the total capital expenditure for nuclear generation projects. An annual make up amount of about one per cent per annum by weight is required thereafter.

A minute amount of heavy water is present in natural water, about one part in seven thousand being a reasonable average. The production of reactor-grade heavy water is achieved by a dual process of enriching and distillation of natural water. A heavy water production plant of the type used by Hydro, consisting of two enriching units and one finishing unit, has a rated production of 100 kilograms per hour. Hydro estimates that a mature plant will operate at a minimum plant factor of 70 per cent. This level of operation has recently been exceeded at the existing Bruce heavy water plant.

Small quantities of heavy water may be secured occasionally from the world market, principally from the United States and Russia. In Canada, outside Ontario, two plants in Nova Scotia have a total combined production potential of 100 kilograms per hour.

Ontario Hydro has purchased from Atomic Energy of Canada Limited (AECL) the existing heavy water plant at Bruce G.S. having a rated capacity of 100 kilograms per hour, has authorized the construction of a second facility and contemplates commissioning two additional plants at this site. Proposals for construction and financing of these latter two plants have been solicited by Hydro and are currently being studied.

5.2 History of Heavy Water Production in Canada

During World War II, heavy water was produced in a small plant at Trail, B.C. which was later decommissioned. With the advent of the CANDU program during the post war years, AECL contracted with the Canadian General Electric Company and Deuterium of Canada Limited for the construction and operation of two 50 kilograms per hour heavy water plants, both located in Nova Scotia. The former has now achieved its rated output while the latter has never achieved production and is being completely rebuilt.

When Ontario Hydro decided to commit its nuclear generation requirements to the CANDU reactor, concern about heavy water supply resulted in the construction by AECL of the first Bruce heavy water plant and in an agreement between AECL and Ontario Hydro (the AECL/Hydro Pool Agreement). This provides for the pooling of all heavy water supplies, whether produced or purchased, and the allocation of these pooled supplies to the parties at prices established by formula.

Hydro's heavy water requirements for the first four units at Pickering G.S. were met in accordance with the Pool Agreement. It terminates on January 1st, 1978, or when the heavy water requirements of the first four units at Bruce G.S. are satisfied, whichever is later. The Pool Agreement provides high priority to Hydro for heavy water to meet its requirements. However, as Hydro was unsuccessful in its attempts to ensure post-1978 supply by means of an extension of the Agreement, it decided to ensure its own supplies after 1978. Accordingly, in late 1973, Hydro exercised its option to purchase the existing Bruce Heavy Water Plant. Hydro also made plans to build three additional plants each of the same capacity at Bruce. This total capacity operating at expected performance levels will produce some

2400 megagrams per year which Hydro determined would meet its heavy water requirements well into the 1990's. This production level is sufficient to permit the installation of one 3,000 megawatt nuclear generating station every 15 months.

In its planning of heavy water production, Hydro is of the opinion that, due to the past history of this type of plant, it is necessary to add an 18 month reliability buffer to the scheduled requirement date for heavy water. In addition, Hydro considers that heavy water is required on site for testing and commissioning 21 months ahead of the scheduled in-service date for a nuclear generating unit. The planning is therefore on the basis that heavy water should be available some 39 months ahead of the date when a nuclear generating unit is to achieve output of electricity. It should be noted, however, that with regard to Pickering GS units 1 to 4, this lead time was substantially reduced through the implementation of a contingency plan for heavy water shortfall which involved the testing of plant systems with natural water.

5.3 Views of the Intervenors

The OMEA submitted that Hydro should devote increased research and development effort into improved processes

for the production of heavy water and opposed any lease-purchase arrangement for the additional heavy water plants proposed by Hydro.

5.4 Views of the Board

The Board is not satisfied with the presentation made by Hydro in respect of its heavy water requirements and the means by which Hydro proposes to arrange for future supplies. The figures submitted by Hydro to the Board are oversimplified, misleading, and do not stand up to rigorous examination.

Hydro has stated that it desires an 18 month buffer and a 21 month lead time to ensure that heavy water supplies are available for testing and commissioning a nuclear generating unit. No quantitative justification was presented for these figures, and some conflict was noted in the testimony as to how they were calculated. The Board is of the opinion that both the 18 month buffer and the 21 month lead time are excessive.

In the view of the Board, the matter of the responsibility for the design, construction and commissioning of heavy water plant should be the subject of a specific review within Hydro to ensure that all aspects of design and construction are the undivided responsibility of

Hydro's Design and Construction sub-branch, and that this group should be required to schedule the production of heavy water in a manner compatible with that used for other components of the generation program.

Moreover, in view of the importance of the supply of heavy water to the Hydro program and the deficiencies in Hydro's presentation of this matter, the Board suggests that Hydro, before committing the construction of a fourth heavy water plant at Bruce, should commission an independent review of heavy water supplies and requirements by an agency external to Hydro.

OPERATION & MAINTENANCE

CONSIDERATIONS

6.1 Power System Operation

In order to meet the fluctuating daily and seasonal demand for electric energy, Ontario Hydro, in common with other major utilities, employs a sophisticated method of scheduling the operation of its various generating units. In general, considerations of security and incremental production cost govern the selection and operation of units to meet daily requirements. Over a longer period, other matters are considered such as maintenance scheduling, fuel contract utilization, hydraulic resource availability and weather.

In addition, both short- and long-term power purchases are utilized to meet demand. Conversely, sales of surplus energy are made when economic and where demand exists.

Hydro's membership in the Northeast Power Coordinating Council and its intimate association with adjacent utilities enables it to co-ordinate its operations with others to mutual economic advantage and to minimize the effect of emergencies.

6.2 The Bulk Power Transmission System

The wide distribution of the various generating stations of Ontario Hydro requires a strong high voltage bulk transmission system to ensure efficient utilization of these plants. The bulk transmission system must be of sufficient electrical strength to meet foreseeable conditions imposed on it, and sufficiently flexible to minimize the effect of emergencies. It must possess sufficient redundancy to enable maintenance and repair operations to be carried out with minimum interruption in service.

6.3 Interconnections

The Ontario Hydro power system is synchronously interconnected with electric systems in Manitoba, Michigan and New York. A substantial connection with Quebec has been maintained over many years but this is basically served by isolated generating units and is intended as a "one way" interconnection only, providing for capacity purchases by Ontario Hydro.

Some power purchases are made from Quebec, as noted above, and some are being negotiated with the province of Manitoba. Other than the power secured under these two contracts, Hydro does not buy or sell power on a firm basis.

In addition to the economic advantages that flow from the ability to exchange power with interconnected systems, the existence of strong interconnections contributes materially to ensuring the electrical stability of these systems.

6.4 Maintenance

The hydroelectric generating machinery and equipment is characterized by relatively high dependability, and maintenance requirements can be forecast well in advance. The use of large fossil and nuclear generating plants, with extremely complex mechanical-electrical systems, has required Ontario Hydro to devise new and sophisticated maintenance practices and schedules designed to keep equipment availability at a maximum, particularly at times of peak demand. The bulk power transmission system and associated transformation equipment must be maintained on a compatible basis.

Hydro has experienced a number of problems in connection with the dependability of certain of its fossil generating units which, despite considerable attention, demonstrate a degree of reliability which is less than satisfactory.

6.5 Views of Intervenors

No views relating to operation and maintenance were expressed by the intervenors.

6.6 Views of the Board

After a review of the somewhat limited evidence on the subject, the Board is generally satisfied that the procedures of Ontario Hydro relating to operations and maintenance are in accordance with good utility practice. However, in view of the extremely high cost of reserve capacity, the Board is of the opinion that greater effort should be made to minimize the amount of time that equipment, particularly thermal and nuclear plant, is out of service.

THE PROGRAM FOR NEW GENERATION & BULK TRANSMISSION

7.1 The Proposed Program

In order to meet its foreseen load requirements, Hydro proposed a program described below which was approved in principle by the Government in June 1973 and which constituted the basis of Hydro's submission filed with the Board on December 20th, 1973. This program, coupled with presently authorized construction, will ensure that loads to the year 1982 are met with a level of reliability considered by Hydro to be reasonable. In addition, it will provide a basic framework for development beyond that year.

The program was described by Hydro in its submission to the government as follows:

"(i) The construction of an oil-fuelled station at Wesleyville comprising four units each of about 500 MW.

2 Units in services in 1979;

2 Units in service in 1980.

"(ii) The construction of a second CANDU nuclear station at Pickering, comprising four units each of about 500 MW.

1 unit in service in 1980;
2 units in service in 1981;
1 unit in service in 1982.

"(iii) The construction of a second CANDU nuclear station at Bruce, comprising four units each of about 750 MW.

1 unit in service in 1981;
1 unit in service in 1982;
2 units in service in 1983.

(iv) Work by Ontario Hydro, including the obtaining of governmental approvals and public participation, that will enable Ontario Hydro to meet any schedule that may subsequently be approved for a new nuclear station at Bowmanville, having four units each of about 750 MW and the first unit in service in 1982.

"(v) The provision of further power supplies to the West System for 1978, by arranging for purchases of firm power from Manitoba or by adding new units each of about 100 or 150 MW to the existing fossil-fuelled thermal station at Thunder Bay.

"(vi) Work by Ontario Hydro, including the obtaining of governmental approvals, and public participation, to acquire a site for a future thermal-electric

station in the West System, the first unit of which may be brought into service in 1980 or some later year.

"(vii) The exercise by Ontario Hydro of its option to purchase the existing Bruce heavy water production plant which is owned by Atomic Energy of Canada Limited. This plant has a nominal capacity of 800 tons per year.

"(viii) The building by Ontario Hydro of a second heavy water production plant at Bruce, with a nominal capacity of 800 tons per year, for in-service in 1977 or 1978.

"(ix) The continued effort by Ontario Hydro to ensure construction of further new heavy water production plants in Canada in order to meet the total requirements of the Canadian nuclear industry. Present indications are that this will require early construction in Canada of heavy water production facilities having a nominal capacity of 1600 tons per year.

"(x) The purchase by Ontario Hydro of Inverhuron Park, in order to facilitate expansion of the heavy water production facilities and construction of the CANDU nuclear generation facilities at the Bruce Nuclear Power Development."

When approval in principle of this program was received from the government, Hydro proceeded with arrangements to acquire a new site for the West System, to commence preliminary negotiations in connection with the new Pickering, Bruce and Wesleyville stations, to purchase Inverhuron Park, to purchase the heavy water plant at Bruce and to authorize the construction of a second heavy water plant. With the on-set of the world oil crisis during 1973, Hydro reviewed the question of fuel for the Wesleyville plant and confirmed that it should be fuelled with residual oil.

In addition, negotiations with Manitoba Hydro in respect of the purchase of firm capacity were brought to a successful conclusion subject to ratification by the Manitoba government. However, Hydro stated that new prospective load requirements make it unlikely that this purchase will permit a deferment of its proposed installations in the West System.

7.2 Cost of the Program

The cost of the Generation Development Program 1977-82 was estimated to be as follows:

<u>Station or Facility</u>	<u>Capital Cost</u> <u>\$million*</u>
Pickering "B" - 4 x 500 MW nuclear units	1251
Bruce "B" - 4 x 750 MW nuclear units	1904
Bowmanville - 4 x 750 MW nuclear units	2107
Wesleyville - 4 x 500 MW fossil units	672
Thunder Bay - 2 x 150 MW fossil units	171
Bruce Heavy Water Plants, "B", "C" and "D"	1071
West System - 2 x 200 MW, fossil units	263
	<hr/>
TOTAL	<u>7439</u>

* Cost estimates revised on the basis of November 1973 escalation forecast and March 1974 interest rate forecast.

It should be noted that the program, approved in principle by the government, did not contain a specific reference to the associated bulk transmission facilities required. This program which amounted to \$1,283 million in cost was included in the program filed with the Ontario Energy Board.

Table 1 provides a view of capital expenditures on Hydro's Generation Development Program 1977-1982, within the larger picture of total capital expenditures up to 1986. The total capital expenditures to 1986 are forecast to amount in escalated dollars to \$30,943 million. The annual breakdown of that figure is listed in column 6, which shows \$890 million for 1974, rising to \$3,987 million in 1986. The figures in columns 7, 8

TABLE 1

EXPENDITURES ON GENERATION PROJECTS
AND HEAVY WATER PLANTS BY CATEGORIES

REVISED SUMMARY OF LONG RANGE EXPENDITURE PROJECTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year	Generation Projects	Heavy Water Plants	Sub Total	Total Other Projects	Total All Projects	Current Projects	System Expansion Program	Future Projects	Total
1974	499	41	540	350	890	487	53	--	540
1975	609	102	711	401	1,112	489	222	--	711
1976	670	210	880	488	1,368	318	562	--	880
1977	841	418	1,259	546	1,805	178	1,081	--	1,259
1978	1,109	236	1,345	546	1,891	70	1,217	58	1,345
1979	1,324	64	1,388	694	2,082	10	1,216	162	1,388
1980	1,469	--	1,469	807	2,276	--	1,102	367	1,469
1981	1,613	--	1,613	925	2,538	--	920	693	1,613
1982	1,821	--	1,821	895	2,716	--	623	1,198	1,821
1983	2,085	--	2,085	958	3,043	--	329	1,756	2,085
1984	2,346	--	2,346	1,118	3,464	--	104	2,242	2,346
1985	2,575	--	2,575	1,196	3,771	--	10	2,565	2,575
1986	2,809	--	2,809	1,178	3,987	--	--	2,809	2,809
TOTAL	19,770	1,071	20,841	10,102	30,943	1,552	7,439	11,850	20,841

Note: (1) The above table updates the information contained in Volume Three of the Financial Policies and Objectives Submission; Supplement 4.0-4, Page 2.

(2) No attempt has been made to identify the relationship of expenditures on "Other Projects" such as heavy water purchases, transformer stations, transmission lines and distribution lines, to the System Expansion Program. Requirements for additional transmission and transformation capacity cannot be directly related to specific generation projects and, therefore, that portion attributed to the generation proposals in the System Expansion Program cannot be determined precisely.

(3) Figures have been revised to include the November 1973 escalation forecast and the March 1974 interest rate forecast of Ontario Hydro.

and 9 of Table 1 demonstrate the relative size of the current, planned and future generation programs in terms of capital expenditures over that same period. In column 7, the current projects to which Hydro is committed are forecast to amount to \$1,552 million. These expenditures terminate in 1979. Column 8 provides the estimated annual expenditures on the planned projects of the Generation Development Program 1977-1982 including the heavy water plants. These expenditures are forecast to amount to \$7,439 million starting in 1974 and terminating in 1985. Column 9 lists possible expenditures on the future projects, with in-service dates after 1982. These expenditures are expected to start in 1978 and are forecast to amount to \$11,850 million by the end of 1986.

Column 10 of Table 1 provides a summary of expenditures on all generation projects, including heavy water plants and shows that these are forecast to amount to \$20,841 million by the end of 1986.

7.3 Planning the Generation Program

As described earlier in section 3, in determining the size, location, type and characteristics of generating units required for installation to meet load requirements, Hydro maintains a continuing review of potential application

of available technology. Broadly based studies are employed to delineate the practical choices available to meet program requirements. These are subsequently narrowed to a limited number of alternatives by engineering-economic studies.

The final choice of unit sizes, types, locations and characteristics hinges on the results of detailed analyses tempered by practical managerial and technical judgment.

7.4 Options open to Hydro in connection with the Generation Development Program, 1977-1982

In order to provide sufficient capacity to meet forecast load requirements to 1982, the following practical options or combination thereof were open to Ontario Hydro:

1. Development of some of the residual hydroelectric potential within the Province, including pumped storage sites.
2. Construction of new fossil-fired thermal units, including conventional steam units, combined cycle units or combustion turbines.

3. Construction of new nuclear units either CANDU or light water type.
4. Purchase of capacity from other systems.

Hydroelectric Development

A number of potential hydroelectric sites still exist in Ontario. However, for the most part, these are remote and in some cases unacceptable for development for environmental reasons. It is Hydro's opinion that until loads develop in their immediate vicinity none of the prospective projects are economically attractive. A few potential pumped storage locations are available but Hydro does not consider that these will become economic for development until the late 1980's.

Fossil-fired Units

Hydro has conducted a series of studies regarding the type and size of conventional fossil-fired units which could be utilized in the generation program and has concluded that conventional (not supercritical) units in the size range of 500- 750 megawatts are the best choice for the immediate future. The analysis conducted by Hydro in respect of the Wesleyville station indicates that although a slight economic advantage can be demonstrated for 750 MW units, other considerations, principally the

increased reliability associated with maintaining a unit size with which Hydro is familiar, dictate that the units chosen should be 500 megawatts in size.

Nuclear Units

Hydro has made a number of short term analyses in respect of the comparative economics of fossil-fired and nuclear units, and has concluded that nuclear units possess an advantage when annual capacity factors exceed about 60 per cent. In respect of unit size, Hydro has compared 500 and 750 MW nuclear units and has determined that as the economic difference between them on the short term is slight, the selection may be based on other considerations.

Hydro has not considered the use of any of the types of American light water reactors for its system. Comparative economic studies of these are, however, currently being conducted, although Hydro has noted that the use of this type of reactor would require Hydro to be dependent on foreign-produced enriched uranium fuel.

In conjunction with Atomic Energy of Canada Limited, Hydro is currently studying in detail the development of a CANDU nuclear plant employing 1200 MW turbine-generator units for use in its ongoing generation program,

subsequent to 1982. Hydro is also considering modifications to the design of existing nuclear units to permit better load following characteristics.

Purchased Power

Ontario Hydro has been obtaining a supply of power from Manitoba Hydro for the West System and has recently concluded an agreement for an additional supply of firm power for the period ending in 1981. The agreement enables Hydro to purchase a total of 150 megawatts in 1978, 200 megawatts in 1979 and 1980 and 150 megawatts in 1981. For reasons not known to the Board, ratification of this agreement by the Manitoba Cabinet has not yet been provided. For the East System, Hydro purchases firm power from Quebec, but its contracts all expire by the end of 1977 and Hydro states that Hydro Quebec has shown no willingness to consider their renewal.

Hydro has negotiated arrangements with its neighbouring utilities in the U.S.A. for the exchange of electric power on a short term basis in emergencies and for economy of operation. These arrangements are effected under export licences provided by the National Energy Board.

7.5 View of the Intervenors

The Sierra Club questioned the necessity for generation

reserves to be as high as forecast by Hydro. It advocated consideration of smaller generating units located closer to the load to minimize the amount of land dedicated to transmission corridors. Other features of the proposed program were also criticized, such as the necessity to provide for loads which double every decade, low thermal efficiencies of fossil and nuclear generating stations, lack of information on plans for future disposal of radioactive waste, the possible development of hydraulic sites and inadequacy of energy conservation measures.

Mr. Kalevar commented on undesirable environmental features, particularly of both fossil-fired and nuclear generating stations.

The Niagara Basic Power Users Committee argued that emphasis upon a relatively unproven capital-intensive nuclear system might not be appropriate at this stage in time. It also stated that generally Ontario Hydro was not sufficiently cost conscious when determining the size of its future programs.

The OMEA noted its approval of the CANDU nuclear reactor but commented that it felt that further research and development of reactor types and sizes should be undertaken immediately for the post 1982 generation program.

Mr. Rose commented regarding the undesirable aspects of nuclear generating stations, particularly in respect of radioactive waste disposal and the possibility of accidents at nuclear power stations.

7.6 Views of the Board

The Board does not consider that Hydro has made a convincing case in respect of the amount of reserve generating capacity which it requires. No evidence was adduced by Hydro which would give the Board any measure of the degree of service reliability required by its customers other than an expressed desire to follow an arbitrary industry standard (1 day in 10 years). In the opinion of the Board, the generation reserve margins proposed by Hydro for the program period 1977 to 1982 could be reduced substantially without significantly affecting quality of service or the choice of economically optimal alternatives. Furthermore, the Board suggests that as the customers of Ontario Hydro become more aware of the capital-intensive nature of the projected system expansion program and the consequent effect on financing and the cost of power, they will be willing to accept a lower than traditional standard of reliability.

In view of the foregoing, the Board suggests that important modifications to the reserve capacity policy of Hydro are warranted and that positive action must be taken

to formulate a policy regarding generation reserve which more properly reflects customer requirements. Therefore, the Board offers the following proposals:

1. That Hydro commission an independent study by a multi-disciplinary task force comprising experts drawn from sources inside and outside of those sectors traditionally considered as comprising the electric power industry. The aim of the task force would be to establish a new and innovative reserve capacity policy. Such a study should take cognizance of the actions suggested below and should assess matters such as the value of various levels of reliability to different customer classes, alternative rate structures linked to reliability, as well as the incorporation into the reserve policy considerations such as voltage reduction, interconnection facilities, interconnection and inter-pool diversity, selective load shedding, wider use of interruptible power contracts, and other similar measures.
2. That, pending the results of the study mentioned above, Hydro reduce immediately by five percentage points its estimates of reserve capacity requirements, which are expressed as a percent of firm load. Engineering, construction and financial schedules should be amended accordingly recognizing that certain committed schedules

may have to be maintained in view of the financial consequences of deferments of the in-service dates of facilities.

3. That Hydro establish "management by objective" targets for each of its organizational units to ensure that every reasonable, economic effort is made towards reducing the margin between installed capacity and firm load to a level more nearly in keeping with the North American average. Also, Hydro should sponsor a co-operative inter-utility program designed to facilitate the interchange and true comparison of unit and component reliability data which would serve as the basis for regular reports to the Hydro Board.
4. That Hydro embark on a public relations program to explain to its customers the reasons for and the possible consequences of a change in generation reserve policy and assist its customers to make any adjustments to their operations which may be required consequent to such a change.

The Board notes that Hydro did not present evidence of a clear-cut policy in respect of the purchase of major generating units but did indicate a strong bias toward the purchase of Canadian manufactured units. The Board suggests that this may not be entirely in Hydro's

best interest. It may be that despite possible merits in the broader national interest, it is a policy that Hydro cannot afford. The Board suggests that a comprehensive study of this matter should be undertaken by Hydro in co-operation with the Government of Ontario.

The predominantly nuclear generation program proposed by Hydro gives rise to concern in view of its inherent reliance on a promising but not thoroughly proven nuclear system. At the same time, the Board recognizes that for the near future the alternative of fossil-fuelled generation raises other serious objections, including the reluctance of the public to accept increased air pollution. The Board considers that Hydro should have maintained an up-to-date and in-depth evaluation of American BWR and PWR nuclear generating units and considers Hydro's generation planning to have been deficient in view of the lack of such information.

Atomic Energy of Canada Limited has stated in its 1973 annual report that 1200 megawatt CANDU units could be committed in 1976. The Board notes that larger units would reduce pressure on the number of new sites required and suggests that Hydro should accelerate its current evaluation in this regard as part of the planning of the post-1982 generation development program.

The Board concluded and has already reported, in its interim report of May 21, 1974, that the following parts of the 1977-82 Generation Development Program might be authorized specifically by the government:

Pickering "B" and Wesleyville generating projects
Heavy Water Plants B and C.

The Board understands that the above projects have now been specifically authorized by the government. The Board suggests that the other major projects in the East System (Bruce B, Bowmanville and Heavy Water Plant D) be not specifically authorized until the Minister of Energy is satisfied, from reports to him by Ontario Hydro, that adequate consideration has been given to the matters discussed in this report.

For the West System, the Board considers that the program proposed by Hydro is reasonable and that authorization to proceed should be granted whenever the government is satisfied with respect to public participation and scheduling. The schedule for this program depends on ratification of the power purchase agreement with Manitoba and the development of new loads of which Hydro has notice.

ALTERNATIVE PROGRAMS

8.1 The Alternative Programs Considered

The Board found itself in some difficulty in assessing the merits of Hydro's 1977-82 Generation Development Program as a whole because of lack of any evidence describing possible alternative programs. Changes in a part of the program cannot be adequately considered in isolation. They need to be considered in relation to other changes they make appropriate in the program as a whole. The Board was in no position to develop the best alternative program and, with the hearing under way, time did not permit a comprehensive study by Hydro. However, the Board thought that studies of two possible alternatives - not necessarily the best - would produce results that would help in assessing the merits of Hydro's proposed 1977-82 Generation Development Program, and especially the later stages of that program. Accordingly, at the request of the Board, Hydro made studies of the following:

ALTERNATIVE PROGRAM A

Defer Heavy Water plant D from 1979 to 1983.

ALTERNATIVE PROGRAM B

Change Bowmanville from nuclear to fossil generation.

The results of the studies of these alternatives were presented at the Board's hearing on June 3rd, 1974.

8.2 Alternative Program A

In its study of Alternative Program A, Hydro assumed that deferral of Heavy Water Plant D to 1983 would imply deferral of each future nuclear generating unit by one year commencing with the first unit at Bowmanville.

The basic effects, according to the study, would be reduction in capital cost of the generation program in the order of \$1,471 million, a reduction in system reliability and increased consumption of fossil fuel and increased operating costs.

8.3 Alternative Program B

In its study of Alternative Program B, Hydro assumed that the change from nuclear to fossil would imply deferral of the in-service date for heavy water Plant D from 1979 to 1984.

The basic effects, according to the study, would be a reduction in the capital cost of the generation program in the order of \$773 million, a much greater dependence on fossil fuel supply, increased operating costs, possible environmental complications and likely additional offsetting capital

expenditures for fuel transportation facilities.

8.4 Comments by Ontario Hydro

Hydro concluded that the savings in capital expenditure attending these alternative programs would be offset by the additional expenditures resulting from the need for increased supplies of fossil fuel and from the effect of inflation on delayed construction.

In connection with the alternative programs, the Board suggested that Hydro re-examine its policy in respect of the value placed on interconnections. Hydro concluded that, while interconnections offered some value as a source of reserve, Hydro policy which places a zero value on interconnections should not be changed at this time.

8.5 Views of the Board

The Board is not able to conclude, on the basis of the studies carried out for it by Hydro, that one of the two alternative programs should be adopted in preference to Hydro's proposal. However, the studies do indicate the need for further consideration of the kinds of plant to be chosen in the last stage of the 1977-82 Generation Development Program and in the earliest stage of the post-1982 program. Hydro's choice was a nuclear plant at Bowmanville for the last stage of the 1977-82 Generation Development Program, to be followed by a fossil plant.

There is little serious dispute over the need for Hydro to be predominantly nuclear in its future generating programs despite the high capital costs and, indeed, despite some yet unresolved problems particularly in respect to nuclear waste disposal. This does not mean, however, that there is no place in future planning for fossil-fired plants. As Hydro itself recognizes in its report entitled Long Range Planning of the Electric Power System, dated February 1, 1974, optimum results are obtained by the installation of a mix of nuclear and fossil-fired plants. Therefore, what the Board is questioning is really the matter of timing for bringing plants of different kinds into service in the early 1980's.

The Board is prepared to accept, in the absence of more detailed investigation, that the alternative programs would have the consequences shown by Hydro's studies. The Board is reluctant to accept, however, as Hydro seems to, that a decision to defer construction should be influenced by the expectation that inflation will make it cost more later. Such a consideration tends to lessen the importance attached to the problems of financing, and at current costs of money and Hydro's projected levels of expenditure, these problems are of major importance.

The Board has carefully noted the evidence in respect of the performance of CANDU reactors and associated generating equipment to date. The results have been very good so far but Hydro has testified that more operating time is required before the Pickering units achieve reliable operating maturity. The Board also notes that no operating experience has been gained in connection with the 750 megawatt Bruce units, the size proposed for the nuclear plant at Bowmanville.

Prudence would suggest that serious consideration be given by Ontario Hydro to a change in its proposed system expansion program in order to advance the schedule of one of the fossil-fired plants in the future program while, at the same time, delaying the construction of a nuclear plant now proposed at Bowmanville in the 1977-82 Generation Development Program. This would not only permit some reduction in the demand for capital but would also permit the accumulation of operating and maintenance experience with nuclear plants.

The Board recognizes that the change proposed above cannot be lightly undertaken, in spite of the advantages it might bring, and that it would require, in particular, assurance of a reliable supply of fuel, having regard to environmental and other constraints.

The Board accepts the fact that adoption of the change it suggests, or even a thorough study of the appropriateness of its adoption, would involve some disruption to Hydro's schedules but notes that with the reduction in reserve capacity recommended by the Board, some additional time is available to effect changes.

In view of Hydro's concern about future fuel supplies, the Board suggests for consideration by Hydro that the steam generating equipment for the next fossil station (after Wesleyville, which has now been authorized), be capable of being fired by either coal or residual oil. In addition, the basic configuration of the plant and site should be so arranged as to permit conversion from one type of fuel to the other. The Board recognizes the increased capital cost but notes the uncertainties of future supplies and prices for both fuels.

As to the location of the next fossil station, the Board considers that this is a matter outside the terms of its reference, but would commend a study of plant expansion at the Wesleyville site. The Bowmanville site might be retained for its presently planned use for a nuclear station, such use being merely postponed.

PART 2

FINANCIAL POLICIES AND OBJECTIVES

FORECAST OF CAPITAL EXPENDITURES

Considerable attention was devoted during the hearing to the complex matter of forecasting capital expenditures. In its original submission and in the 16 ancillary exhibits, Hydro presented its views regarding the purpose of the capital expenditure forecast, the categories of expenditures and the procedural processes involved.

Hydro considers the forecast of capital expenditures, both for the system expansion program for 1977 to 1982 and for the longer overlapping period 1974 to 1986 as the basic source material for the establishment of financial policies that will ensure the availability of capital in adequate amounts and at the proper time.

The capital requirements of Hydro for a selected period of time are set forth in its Capital Construction Program under three categories: current, planned and future projects. These projects include not only the major generating plants but also transformer stations, transmission lines, distribution systems, communication equipment and other associated facilities. The Capital Construction Program for the coming year is submitted annually for approval by the Hydro Board. Hydro emphasized that decisions respecting each category of project can be and are made independent of one another. Hydro argued that decisions relating

to the system expansion program before the Board need not inadvertently result in a commitment of post 1982 projects.

The procedure for the planning, authorizing and controlling of capital construction activities is known as the Capital Construction Program System (CCP System). This system provides a mechanism for the organized approval, release, control and reporting of all capital expenditures in Ontario Hydro.

The process begins with the preparation of a plan which includes the schedule and estimated cost of the various projects comprising the plan. The plan, schedules and costs are prepared by a designated "committing authority", the engineering or planning group responsible for the activity. These plans, schedules and estimated costs for future projects constitute the first step in the capital forecasting cycle. After a final review of the program, the committing authority arranges for the formal release of the project. Such release is tantamount to formal approval of all aspects of the project including its estimated cost and anticipated in-service date. At this time, the controlling authority, one of the design, construction or operations groups, is established. This authority is then assigned the responsibility for executing the work, controlling the cost, meeting the timing schedules and securing the necessary approval for variances between the estimated and actual costs.

Chapter 9 continued

During the construction stage, the actual costs are retained in a computerized job costing system developed by Hydro and known as the Capital Construction Program Forecasting and Reporting system (CAPFOR). In addition to its major function, which is to monitor the several thousand active and planned projects which are at any one time in Hydro in various stages of activity, CAPFOR records are used to prepare short-range (generally 5 year) and long-range forecasts of capital expenditure requirements. As data from projects under construction are continually added to the program, they are incorporated in a statistical analysis of cumulative expenditure patterns. For minor projects these expenditure curves are used to produce the expenditure flow forecasts whereas major projects would use actual cash flow projections provided by the relevant engineering group.

In addition to expenditure forecasting, the CAPFOR system provides an estimate of in-service dates that combines with estimated total costs to produce a forecast of the value of assets coming into service. This in turn becomes the basis for forecasting depreciation rates, interest charges, other asset-related costs and cash flows.

The forecast capital expenditures for the committed or approved projects become the basic input to the capital expenditures (CAPEXP) module of the long-range financial simulation program (The Financial Planning Model). This module relies upon

the input data and the forecasting capability of the CAPFOR system and, in effect, is an extension in time to CAPFOR, extrapolating ongoing project costs for as long a period into the future as required to give a long-range view of capital expenditures. Hydro explained that although the numbers generated by the simulation process may give the appearance of precision, significant forecasting errors can arise from inaccuracies inherent in estimating present day construction costs of new prototype stations, future escalation and interest rates, and required construction periods. Table 1 of Chapter 7 contains capital expenditure projections for current, proposed and future projects through to 1986 as extracted from the CAPEXP module of the current Financial Planning Model.

Hydro witnesses demonstrated the power of the CAPEXP module by tabling seven typical reports produced by the model covering total capital expenditures for the period 1974 to 1986. The operation of the CAPEXP module was discussed in terms of the prototype Wesleyville Generating Station. Consideration was given to: the application of escalation forecasts to the current dollar estimates of the capital cost of the station; the incorporation in the model of in-service dates for each generating unit; the method of showing the annual and cumulative capital expenditures for each major class of assets in the station; the presentation of the annual additions to plant in service; and finally, derivation of the annual capital expenditures on both a current and constant dollar basis for the station as a whole.

The capital expenditure projections are consistent with the projections of the Financial Planning Model (FPM), which is a computerized simulation model of Hydro's major financial features. This is discussed in more detail in Chapter 13.

9.1 Views of the Intervenors

No views were expressed by the intervenors on the subject of capital expenditure forecasting.

9.2 Views of the Board

Mr. Macaulay commented on the problem of constantly changing estimates of capital costs throughout the course of the hearings and the apparent lack of clear distinction between current, planned and future generation programs. The Board accepts Hydro's response that in light of the recent alarming cost increases throughout the economy, it is inevitable that escalation forecasts will have to be continually revised, and that it is important that the Board have available for its consideration the latest and best cost and planning projections available at the point at which it must render its opinion.

The question was raised as to whether the system expansion program, as submitted, incorporated costs of potential future projects with in-service dates after

1982 which might become "embedded" in an approval of the program as presented. The Board accepts Hydro's demonstration in closing argument that this should not pose problems if, in future, system expansion project costs are segregated from future projects (as in Table 1). More will be said on the issue of the question of "packaging" future system expansion programs in Chapter 14, which contains some recommendations for future hearings.

The Board considers that Hydro's system for forecasting and control of capital expenditures is well founded, functional and satisfactory.

FINANCIAL STRUCTURE AND OBJECTIVES

The terms of reference for Phase II require the Ontario Energy Board to investigate and report on "the financial policies of Ontario Hydro together with financial objectives". The reference specifically covered "broad policy matters" leaving until later hearings "detailed study of associated issues" and "in particular, the details of depreciation policies, interest and overhead allocations and power costing". Hydro began its Phase II submission with a discussion of its financial structure and financial objectives which are the subject of this chapter.

10.1 Financial Structure

Under this heading Ontario Hydro described the beginnings of the "co-operative enterprise established by a number of municipalities whose objective was to obtain a reliable supply of power at cost". It was explained that as part of the early decision to finance from borrowed capital rather than through the issuance of capital stock, the founders of Hydro decided on the unorthodox practice of including in the cost of power an annual charge sufficient to retire the debt incurred in acquiring the original facilities. As the charge, in effect, duplicated the depreciation charge, it was a unique, and sometimes controversial, form of equity financing which, by the end of 1973, totalled \$943 million

or 70 per cent of total equity in the enterprise. The remainder consists of grants from the Province for assistance to rural distribution plant construction, now discontinued, and customer contributions to the Reserve for Stabilization of Rates and Contingencies.

Hydro stated that this combination of debt and customer-contributed financing, along with the power at cost concept, are the main determinants of Ontario Hydro's financial structure. A conventional capital structure incorporating share capital and retained earnings would increase costs by virtue of the need to pay dividends to the equity holders and would destroy the co-operative nature of the enterprise. Conversely, a "pay-as-you-go", debt-free, basis of financing would result in an exorbitant increase in rates to present customers, with the benefits accruing primarily to future customers.

10.2 Financial Objectives

Under this heading, Hydro said that its primary objective is "to supply the demands of the people of Ontario for electric energy at the lowest feasible cost consistent with safety to its employees and public, a high quality of service to its customers, and subject to the social, economic and environmental concerns of the people of Ontario". In order to

carry out this primary objective, Ontario Hydro adopted in a decision of the then Commission, dated December 12, 1973, the following financial objectives:

1. To finance needed facilities at the lowest feasible cost consistent with a financially sound operation.
2. To allocate the cost of capital facilities equitably among present and future customers.
3. To be financially independent, remaining at arm's length from government in financial matters, excepting the provincial guarantee of Hydro's bond issues.
4. To maintain a level of liquidity sufficient to achieve the above objectives.

Hydro stated in evidence that these financial objectives are consistent with and represent extensions of the primary objective of power at lowest feasible cost. It was explained that although these objectives had not been formalized before the December 1973 Commission meeting, they represented in the main a continuation of past policies. Hydro said that both the primary objective of power at lowest feasible cost and the financial objectives were consistent with recommendations of Task Force Hydro. Hydro explained that "financial independence" in the third recommendation meant that, despite the provincial guarantee, Hydro saw its obligation "to stand

on its own feet financially" so that "Ontario Hydro's customers neither subsidize nor are subsidized by government". Having adopted the foregoing financial objectives, the then Commission confirmed the financial policies which are the subject of Chapter 11 following, and then subsequently approved a financial plan for 1973-1977 based on these policies and objectives which is the subject of Chapter 13.

10.3 Views of the Intervenors

While accepting Hydro's statement of financial objectives as "almost in the motherhood class", the OMEA attacked the primary objective's notion of "lowest feasible cost" as inviting "interpretation, restriction, the introduction of irrelevant concepts current in the investor-owned corporation and external regulation".

The OMEA was also of the view that the primary objective was inconsistent with the third financial objective's concern with financial independence -- "a fundamental, essential objective which (the OMEA) has always pressed on Ontario Hydro". Financial independence cannot be achieved, the OMEA said, if Hydro is to be required to interpret, assess and evaluate the social, economic and environmental concerns of the people of Ontario, as required by the primary objective. To the OMEA,

"this is the business and responsibility of Government.
Let us leave it to Government".

The OMEA adamantly opposed the proposition that the provincial government take an equity interest in Ontario Hydro in return for providing capital. "Any such scheme would be very quickly seen to be a massive subsidy of Hydro by the Province", it said.

10.4 Views of the Board

The Board understands and accepts the reluctance of Hydro and the OMEA to consider any plan whereby the Province might assume an equity position in Hydro to assist in raising the enormous amounts of capital which the enterprise will need in the years to come. In addition to the obvious traditional and political arguments that can be put forward in opposition to such a change in financial structure, as the OMEA pointed out, it would do nothing to lessen the combined need for capital of the Province and Hydro. Financial witnesses made much of the point that the two are seen as essentially one "credit" by the capital market, because of the provincial guarantee of Hydro's bonds.

The Board does not disagree with either Hydro's primary or its financial objectives as stated in its Phase II submission. One may share Board Counsel's and the OMEA's concern with

the definition of the adjective "feasible" as in "to supply the demands of the people of Ontario for electric energy at the lowest feasible cost...", but a reading of Task Force Hydro's Report Number One makes it clear that the term is intended by the Task Force to convey the notion that the cost of power is to include all appropriate environmental, social and financial charges which in the Task Force's view, were not always properly reflected in the earlier notions of power "at lowest possible cost".

The four financial objectives also are consistent with Task Force Hydro's Report Number Four and are entirely worthy, if somewhat general. The Board's only observation would be that, as stated, the third objective is somewhat difficult to interpret. Evidence adduced at the hearing suggests that Hydro might be expected by investors to have a debt/equity ratio as low as 60/40 without the provincial guarantee, but they might well be satisfied with a ratio of 90/10 with the guarantee. The effects on rate of return or revenue requirements of any substantial change in the relationship of government to Hydro, in the matter of the provincial guarantee of Hydro's bonds, is therefore so great that one wonders what meaning is left in the expression "to be financially independent... excepting the provincial guarantee....".

The Board prefers the Task Force Hydro's wording:

"We believe that (Hydro's financial) objectives should be based on the proposition that Hydro should strive to remain at arm's length from government in matters of financial policy to the degree that this is possible having regard for such matters as the provincial guarantee of its debt and the necessity to comply with the provincial fiscal policy". (Report Number Four, p.16)

FINANCIAL POLICIES

In setting forth its financial policies Hydro emphasized, first, that they are governed by the primary objective of supplying demands for electric energy and the lowest feasible cost and, second, that in keeping with the Minister of Energy's reference, the submission would deal only with broad policy matters. Hydro also emphasized the limited range of alternatives in financial planning and the need to resolve some of the conflicts inherent in the financial objectives as stated in the previous section. Principal among these is the conflict between the objectives of an equitable allocation of costs between present and future customers and the maintenance of a financially sound enterprise. Hydro said that the resolution of this conflict involved two main areas of judgment:

1. What is an acceptable level of contribution from customers for debt retirement and system expansion?
2. What is an acceptable level of borrowing?

In its Report Number Four, Task Force Hydro discussed the fallacy of concluding that a policy of borrowing to pay for new capital assets would always result in higher costs to Hydro's customers than a policy for paying "cash down" for them. But Hydro pointed out in its submission that, on the other hand, to

increase borrowing to the point where Hydro's credit rating is impaired could only result in significant increases in debt service charges to future customers. Hydro said that although there is no precise formula which can be followed in developing alternate financial plans, a target can be established based on historical performance, forecasts of costs and projections of financing needs. This matter will be considered again in Chapter 13 in which Hydro's financial plans are discussed.

The importance of financial charges in aggregate is revealed by the fact that they are forecast to total 8.8 per cent of plant in service and 47 per cent of total revenue requirements in 1975 (Tables 2 and 3). They include depreciation, interest, appropriations for debt retirement and system expansion, and "pay back" in connection with the financing of the Pickering Generating Station. In order to assess how well the objective of maintaining reasonable equality between present and future customers is being maintained, it is helpful to compare the relativity of present and forecast streams of aggregate financial charges, both to plant in service and to forecast revenues.

As shown by Tables 2 and 3, by 1986, financial charges are forecast to increase to 10.1 per cent and 52 per cent of plant in service and total revenues, respectively. The main reason for

TABLE 2

FINANCIAL CHARGES RELATIVE TO PLANT IN SERVICE

(\$ million)

<u>Year</u>	<u>Plant in Service</u>	<u>Non-capitalized Interest %</u>	<u>Depreciation %</u>	<u>Net Income %</u>	<u>Total %</u>
1974	5,933	219 3.7	153 2.6	120 2.0	8.3
1975	6,460	239 3.7	170 2.6	160 2.5	8.8
1976	7,650	289 3.7	196 2.6	159 2.1	8.4
1977	8,872	359 4.0	234 2.6	142 1.6	8.2
1978	9,994	430 4.3	283 2.8	222 2.2	9.3
1979	11,604	523 4.5	342 2.9	312 2.7	10.1
1980	12,931	617 4.8	349 2.7	276 2.1	9.6
1981	14,886	701 4.7	427 2.8	313 2.1	9.6
1982	17,067	812 4.8	519 3.0	351 2.0	9.8
1983	19,274	927 4.8	572 3.0	390 2.0	9.8
1984	21,605	1,047 4.8	682 3.2	437 2.0	10.0
1985	24,746	1,186 4.8	823 3.3	498 2.0	10.1
1986	27,689	1,341 4.8	911 3.3	545 2.0	10.1

Source: Hydro Submission on Financial Policies and Objectives, Volume 3, Supplement 5.1-1, p.4
and Ontario Hydro, Transcript Volume 55, May 21, 1974, p. 7468.

TABLE 3

FINANCIAL CHARGES RELATIVE TO REVENUE
(\\$ million)

<u>Year</u>	<u>Revenue</u>	<u>Non-capitalized Interest</u>	<u>%</u>	<u>Depreciation</u>	<u>%</u>	<u>Net Income</u>	<u>%</u>	<u>Total %</u>
1974	994	219	22	153	15	120	12	49
<u>1975</u>	1,205	239	20	170	14	160	<u>13</u>	<u>47</u>
1976	1,431	289	20	196	14	159	11	45
1977	1,696	359	21	234	14	142	8	43
1978	2,013	430	21	283	14	222	11	46
1979	2,400	523	22	342	14	312	13	49
1980	2,510	617	24	349	14	276	11	49
1981	2,849	701	25	427	15	313	11	51
1982	3,221	812	25	519	16	351	11	52
1983	3,623	927	26	572	16	390	10	52
1984	4,093	1,047	26	682	17	437	10	54
1985	4,700	1,186	25	823	17	498	11	53
<u>1986</u>	5,302	1,341	25	911	17	545	<u>10</u>	<u>52</u>

Source: Same as TABLE 2.

this is that the cost of debt is expected to continue at high levels relative to historical experience, increasing the cost of borrowed funds. The non-capitalized interest column reflects this trend as it represents the cost of borrowed funds reduced by the interest earned on investment and the amount of interest capitalized. Net income, made up of debt retirement and system expansion charges, actually declines relative to both revenue and plant in service. This decline is, however, more than offset both in relation to the increases in plant in service and in revenues by the increasing contribution to cash flow of depreciation over the period to 1986.

Hydro chose to discuss its specific financial policies under five heads:

1. Classification of expenditures to current operations and capital, including policies on overhead and interest,
2. Depreciation,
3. Appropriation for debt retirement and system expansion,
4. Treatment of accumulated equity,
5. Basis for setting aggregate annual revenue requirements.

Each of these areas will now be briefly reviewed.

11.1 Classification of Expenditures

Under this heading, Hydro described the classification of expenditures between current operations and capital as follows:

1. Operation and maintenance, including fuel costs, are expensed to current operations.
2. The costs of constructing or purchasing physical assets are classified as capital expenses.
3. Where practical, expenses for internal services are allocated to the work unit using this service and subsequently to current operations or capital, as appropriate.
4. Appropriate interest and overheads are charged to the capital costs of physical assets prior to their in-service date. After that, such costs are charged to current operations.

Hydro said that present policies on allocating overheads were introduced in 1967 and on interest capitalization in 1968. Hydro stated also that it has made a fairly recent change respecting in-service dates in that whereas formerly capitalization of interest and overheads ceased on the planned

in-service date, whether or not the plant came in on schedule, now the in-service date is taken as the day the operations group formally takes over responsibility for a project.

The 1967 change in policy on the allocation of overheads was made because the pre-existing policy of allocating overheads as percentages on labour or material costs had produced very erratic overheads which were not characteristic of true cost responsibility. The new policy capitalizes at 100% expenses relating directly to construction activities, and those having a significant capital content in proportion to the ratio of current peak load to forecast peak load six years hence. Expenses having a minor relationship with the capital construction program are arbitrarily capitalized at 10%.

Interest capitalized amounted to \$64 million in 1973, some 21% of total interest costs. The interest capitalization rate is "the weighted average interest cost of all long-term borrowing during the preceding three years, rounded downwards to the closest 1/2 of 1 percent." The current interest capitalization rate is 8-1/2%, about midway between the embedded cost of debt and current borrowing rates. Hydro defends this policy on the grounds that since capital expenditures are financed only partly by external borrowings, with the remainder coming from internally-generated funds, i.e., through rates, it is logical to place a value on customers' contributions equal to that which the Corporation would have to pay if it borrowed the same funds.

Under questioning, Hydro's Comptroller agreed that "perhaps" another argument for this practice would be that the very minimum cost to assign to capital contributions by Hydro's customers would be the yield on Hydro's own debt issues, since it would be open to those customers to purchase those issues with the funds diverted to Hydro's capital program. Hydro said that the three-year period was selected after an age distribution of construction in progress expenditures revealed that about 95% of the total represents expenditures made during the preceding three years.

11.2 Depreciation

Depreciation represents the largest single item in the financial policy area with forecast charges amounting to \$153 million in 1974 and rising to \$911 million by 1986 (Table 2). By comparison net income is expected to be \$120 million and \$545 million, respectively, in the two years. Detailed examination of the charge was specifically excluded from the reference as it would have undoubtedly prolonged the hearing beyond the time available. The matter will have further consideration by the Board in its report on Hydro's proposed rates for 1975.

Hydro emphasized that the purpose of its depreciation policy is to distribute the original cost of capital facilities

over the useful lives in a systematic manner, i.e., to recover original costs. Until December 31, 1970, the sinking fund method of depreciation was applied to all fixed assets except office and service equipment which were depreciated on either a straight-line or declining balance basis. Effective January 1, 1971, the straight-line method was introduced and is being applied to all subsequent additions to the system and a variation known as the straight-line remaining life method is applied to the net book value of thermal generating stations in service up to December 31, 1970. The sinking fund method is continued for all assets and services at December 31, 1970, except thermal generating stations.

In addition, for certain minor capital facilities, such as transportation equipment, there is some use of a declining or diminishing balance method of depreciation which recognizes that for certain assets there is a greater exhaustion in the early part of the service life.

Under cross-examination, Hydro witnesses said that their definition of depreciation was generally consistent with that

of the National Association of Regulatory Utility Commissioners and the Federal Power Commission (which have been accepted by the Ontario Energy Board), except for the policy of depreciating land. Hydro said that land-associated costs included such things as legal expenses, surveys, fencing, cost of unwanted buildings and their removal, in addition to the purchase price of the land itself, and it was reasonable to amortize those expenses over a 100-year period. Furthermore, Hydro said that much of the land purchased for transmission corridors is not susceptible to sale in the open market. However, Hydro did indicate its intention to review the question of the depreciation treatment of land costs.

In the words of Hydro's senior financial witness, the overall depreciation policy adopted should be "explicit and defensible in terms of depreciation. That is, the service lives should be appropriate and the depreciation charges should, as much as possible, follow the way in which those facilities are going to be used." (Transcript p.7501).

As against the purity of that objective, however, an Advice of Commission Decision dated June 11, 1970, made it clear that the switch from sinking fund to straight-line depreciation was undertaken at least partly in recognition of the need to

increase internal cash flows. The Advice went on to state, however, that part of the reason for the change was related to a decline in asset lives and the wish to preserve objectives set when asset lives were considerably longer. In the past, when the majority of assets related to hydraulic generation, the average life of total assets was about 47 years, whereas the average life of new and largely thermal generating assets is estimated to be about 32 years. But as asset lives shorten and the period of debt retirement remains the same, Hydro said, the effect is to reduce the total cash flows arising from depreciation and debt retirement over the estimated working life of the assets. One of the results of slower cash generation during a period of heavy capital construction would be to allow the debt/equity ratio to deteriorate. Another reason given for the change to straight-line, particularly for thermal generation assets, was that it would make Hydro's depreciation policy more consistent with that of the majority of utilities.

Asked whether accelerated methods of depreciation, such as the declining balance method, might not more properly follow the use pattern of thermal generation stations over their lives, Hydro witnesses conceded that the question was worth looking into, and promised to do so. At another point, Board Counsel questioned Hydro's policy of assuming zero salvage costs in determining depreciation rates. "Ontario Hydro is

obviously heading into a period of increasing nuclear technology", Mr. Macaulay said, "and the cost of decommissioning nuclear units at the end of their useful life and disposing of radioactive material will not be small" (Transcript p.7291). Hydro agreed to review the matter of salvage and removal costs of future installations, while pointing out that present policy is consistent with experience over the last decade.

On the question of the asset lives, a complicated exercise since Hydro maintains about 400 plant accounts for purposes of depreciation, Board Counsel commented that technology was leading to much more rapid functional obsolescence than in the past, and that he would propose that major plant accounts be reviewed on a rotating basis once every three to five years, rather than irregularly as appeared from the evidence to be the case. Hydro stated that, although constant monitoring of asset lives on a planned basis is required, Hydro's present depreciation reserve as a proportion of total assets (2.2%) is in the middle range in a list of other utilities selected by Mr. Macaulay, which suggests that the total cash flow from this source is reasonable. Asked how he had arrived at a service life of 20 years for heavy water plants, when it was known that, from an economic point of view, refineries with "similar plumbing characteristics" have shorter lives, Hydro's financial vice-president said that it was "simply a guess that (the operations staff) would be able to

get that much useful life out of a plant" (Transcript p. 7019).

The question of a \$57 million unallocated depreciation account was raised at the hearing but detailed consideration of this item was deferred until the summer hearing on bulk power rates.

Board Counsel concluded that in view of the forecast sixfold increase in the provision for depreciation to over \$900 million annually by 1986, the subject of depreciation policy merited a detailed review in a separate reference at some future date.

11.3 Appropriation for debt retirement and system expansion

The appropriation for debt retirement and system expansion consists of both existing and new features. The existing feature is the debt retirement charge, which is one of the original sections of The Power Commission Act and which remained virtually unchanged since 1936. The amount charged each year is established under Section 76 of the Act as "an annual sum sufficient to form in 40 years, with interest at 4% per year, a sinking fund for repayment of advances... for the repayment of any indebtedness... for restoration of any reserve or funds... utilized for the payment of the cost of the works". As discussed in Chapter 10, the debt retirement charge has accounted for the bulk of the equity capital which has been acquired by Ontario Hydro over the years from its customers.

A new feature of the appropriation is the system expansion charge which Hydro says will be used to provide the money needed to maintain financial integrity, reduce dependence on external borrowing and provide needed flexibility in Ontario Hydro's financial affairs. The appropriation for debt retirement is mandatory under The Power Corporation Act. The appropriation for system expansion is, however, not only not mandatory but may require legislation, if not to make it a lawful charge then at least to make its purpose clear in the legislation. Hydro stated that it intended to recommend appropriate amendments to the Act.

Hydro introduced the new system expansion charge on January 1st, 1974 saying that it replaced the former charges in the cost of power for debt retirement and for the Reserve for Stabilization of Rates and Contingencies. "Under the new policy" Hydro said, "the amount to be generated internally, rather than being determined to a large degree by formula, becomes a matter of continuing judgment."

Hydro said that the amount of the debt retirement and system expansion charge would be determined by the following parameters:

1. The flow of internal and external funds would be established with the objective of equitably allocating the cost of power to present and future customers, in concert with economic conditions.
2. The debt/equity ratio would be maintained at a level that will protect Ontario Hydro's credit rating and minimize its cost of capital over the long term.
3. The rate of return on net assets would be employed as a supporting guideline to measure Ontario Hydro's overall financial performance.
4. The minimum appropriation would be the historical debt retirement charge which must be used for debt retirement. Any amount over this minimum may be used either for debt retirement or for system expansion.

Not only would the current formula for establishing a minimum level of funds for debt retirement be retained, Hydro said, but the systematic retiring of debt would be continued to ensure investor confidence while still allowing Hydro the flexibility of retiring more debt if it seemed appropriate.

Half way through the hearing Hydro said that the new Hydro Board had decided on a financial plan according to which the debt retirement and system expansion appropriations for 1975 were to remain at the 10.5% return on equity level selected for 1974. The implications of this decision are reviewed in Chapter 13.

The Hydro submission said that the new appropriation, when combined with the revenue smoothing program and Surplus (Deficit) account (Section 11.5), eliminated the need for a separate provision for rate stabilization and contingencies. Asked where the liquidity will be found to provide for the former purposes of rate stabilization, the Comptroller replied:

"The money will be found in our cash flow or our liquidity position. In other words, the fact that we have provided for a reserve does not necessarily make cash currently available. Major losses and major needs would be looked after by the liquidity position of the total organization." (Transcript p.5042).

Major catastrophies (the example discussed was the Queenston Generating Station falling into the Niagara River) could not be covered by the new policy but, as Hydro pointed out, the old reserve was never large enough for that purpose either.

A great deal of the discussion on the size of the new appropriation related to the third criteria that "the rate of return on net assets be employed as a supporting guideline".

In the December 1973 Advice on Commission Decision establishing the change in policy, the term "rate of return on net assets" was used as the governing mechanism to establish the size of the total appropriation. Apparently at the suggestion of the financial planning group, the final proposals put forward to the Board in March 1974 switched to discussing the rate of return on equity instead. It was given in evidence that a rate of return on net assets of 8.1% is equivalent to the 10.5% rate of return on equity ultimately selected by the Hydro Board. Alternative return calculations and their implications are further discussed in Chapter 13 below.

11.4 Treatment of accumulated customers' equity

Hydro said that since all funds raised through the new appropriation for debt retirement and system expansion represent an acquisition of equity in Ontario Hydro by its customers, the total charges arising therefrom after January 1, 1974, will be allocated each year to the participating municipalities and rural Power District in the same manner as the debt retirement charges were apportioned in the past.

Equities accumulated up to the end of 1973 by contributions to the Reserve for Stabilization of Rates and Contingencies will be allocated to each municipality and the Power District on the basis of debt retirement equities at the end of 1973.

Hydro stated that any over- or under-estimate of revenues will be recovered from customers or returned to them over a three-year period. This is further considered in the next section.

11.5 Basis for Setting Aggregate Revenue Requirements (Revenue Smoothing)

Another new financial policy introduced in the December 1973 Advice of Commission Decision was the policy of revenue smoothing. Hydro said that it believes that rate changes should take into account trends in costs, rather than considering only annual changes which may turn out to be rather erratic. The four basic elements in Hydro's proposal are as follows:

1. To fully recover annual operating costs plus a net income or return component to be allocated to debt retirement and system expansion.
2. To establish rates annually based on a smoothing of forecast aggregate revenue requirement over a three year period.
3. Annual variances between actual revenues and costs including profits to be absorbed through adjustments to future rates, again over a three-year period.

4. Annual variances to be recorded in the Accumulated Surplus (Deficit) account and attributed specifically to each major class of customers, with balances accruing interest at current rates.

In addition, Hydro said that it planned to recover deficits standing against the direct industrial customers of \$10.9 million and retail customers of \$19.9 million as at December 31st, 1973 from those customers over a five-year period beginning in 1975.

An important side effect of the move to revenue smoothing is the discontinuance of the practice of issuing 13th Bills to municipalities, although Hydro indicated that it planned to have discussions with the OMEA before instituting the step. The 13th Bill is a vehicle by which Ontario Hydro reports the difference between the estimated costs of supplying a municipality with power and the actual cost of that supply, either making a rebate if the estimate was high or asking for payment of the deficit if the estimate was low. This arrangement has been a contractual obligation between Hydro and the municipalities. Task Force Hydro pointed out that in recent years revenue deficiencies have been largely met by special withdrawals from the Reserve for Stabilization of Rates and Contingencies and that if these withdrawals had not been made the 13th Bill would have been an unreasonable financial burden on the municipalities. It had therefore

become used primarily to settle relatively minor variances between interim billings and approved annual charges arising from the delayed billing effects and load factor fluctuations. Hydro said it believes that alternative methods for dealing with these variances can be developed.

Hydro deferred the description of the mechanics of applying the foregoing principles to the summer hearing on the 1975 rate increase where the matter was reviewed in more detail.

11.6 Terminology

Going back at least as far as the Ontario Committee on Taxation (Smith Committee) in 1967 and including Task Force Hydro, outside groups that have looked at Ontario Hydro's financial reporting have been unanimous in recommending that Hydro's financial statements be changed to conform, insofar as possible, with conventional accounting principles and practices. Beginning with its 1973 financial statements, Ontario Hydro has taken several important steps in this direction. As stated by one of its senior accountants, "The basic purpose was to attempt to bring our statements into a more comparable basis with that of other corporations and other utilities and to reflect what is referred to as generally accepted accounting principles" (Transcript p.4897).

The most significant change was the introduction on

the statement of operations of the term "net income" which consists of operating surplus left over after deducting the expenses of operating and maintaining the system, including depreciation and interest on outstanding debt. The new statement shows how that income is appropriated for debt retirement, system expansion and (ending in 1973) for the stabilization of rates and contingencies. Formerly these items were shown as costs of service.

In response perhaps to the urgings of Task Force Hydro that the 13th Bill mechanism was outmoded and should be replaced by more up-to-date accounting procedure, Hydro recommended that it be removed as part of the introduction of revenue smoothing. A minor change was the showing of any profit on the redemption of bonds and the sale of investments as a deduction from interest expense for the year. Previously it had been credited to the Reserve for Stabilization of Rates and Contingencies. Finally, a portion of the interest expense, which previously had been allocated to operation, maintenance and administration costs, is now shown as what it really is, namely, interest.

Board Counsel made some reference in the hearing to the continued use of the term "power at cost" by many organizations

including Hydro itself. The phrase, he pointed out, is not to be found in the legislation. "It is", he said, "a misleading phrase which has caused endless difficulty and monumental misunderstanding" (Transcript p.7271). "Hydro is not today selling power at cost", said Mr. Macaulay, "and has never sold power at cost unless, of course, you invent a twisted definition of 'cost' that would be unacceptable to the financial community." The provision for debt retirement contained in Section 76(c) can only be considered a cost if the word is given a special definition, since depreciation of the property is already provided for. Also, a senior Hydro accountant agreed, under cross-examination, that the Reserve for Stabilization of Rates and Contingencies, now to be replaced by the new appropriation, has been analogous to Retained Earnings. Hydro's response to Board Counsel was that Hydro had never used the term power at cost to deceive anyone, and that it considers "cost" to include, in addition to those things commonly known as cost, other appropriations to be borne by its customers, "which by mandatory legislation or permissive legislation are necessary to the success of Ontario Hydro" (Transcript p. 7508).

11.7 Summary of the New Financial Policies

As is evident from the previous six sections, Hydro presented a number of new financial policies in its submission.

Some relate principally to questions of terminology or financial statement presentation while others represent fundamental changes in financial philosophy. In summary the major changes are as follows:

1. Debt retirement is no longer represented as a cost but as an appropriation of net income.
2. The Stabilization of Rates and Contingencies reserve and the associated appropriation (provision) or withdrawal is discontinued in 1974, with the balance in the reserve to be transferred to customers' equity accounts.
3. A system expansion appropriation is added, with the appropriation being credited to customers' equity accounts. The funds are to be used at the discretion of the Hydro Board for plant additions, for debt retirement (if it is deemed appropriate to retire more funds for this purpose than are produced under the traditional 4%, 40-year formula charge), for the stabilization of rates and for contingencies, although it should be noted that the record is not crystal clear on these last two points.
4. The debt retirement and system expansion appropriation for 1974 and 1975 is to aggregate 10.5% of customers' equity as defined. There is no policy relating to

system expansion approved beyond 1975, but debt retirement will continue at the presently legislated level calculated on the 4%, 40-year sinking fund basis.

5. Any annual under- or over-estimate of revenues will be recovered from customers or returned to them over a three-year period, the balances recorded in an Accumulated Surplus (Deficit) account in the meantime. Existing deficits of the direct and retail customer classes are to be recovered over a five-year period.
6. Although the subject of establishing optimum liquidity levels will be deferred to the next chapter, it is important for completeness to record that investments related to debt retirement and stabilization of rates reserves, i.e., the funded portion of these reserves, will be liquidated to a level dictated by a new policy on liquidity. Under this policy, Hydro plans to reduce its total liquidity so that it just covers its cash obligations save only for debt retirements for at least one month, and also provides an amount approximately equal to the proceeds of one Canadian bond issue. It is not made clear whether the requirement is for the larger of these two or the sum of these two items.

All of the above are set out in the Advice of Commission Decision of December 12th, 1973 (Financial Policies and

Objectives, Volume 1, Supplement 1.0-4), and as for the 10.5% return, in the Advice of Board Decision of March 25, 1974 (Exhibit 293).

It should be observed that a decision with respect to eliminating the 13th Bill was made subject to discussion with the OMEA and is still unresolved. Also unresolved at this point is the question of amending The Power Corporation Act to give effect to the new financial policies.

11.8 Views of the Intervenors

The OMEA's submission and testimony were dominated by two very prominent concerns. The first relates to the OMEA's insistence that Ontario Hydro's financial policies and objectives not be "foreign to the municipal cooperative concept" or violate the principles which the OMEA argues have guided the historical relationship between the municipal electric utilities and Ontario Hydro. This refers to the OMEA's claim that Hydro is, and must continue to be, accountable to the municipal utilities for its financial policies. The second "highlight" of the OMEA evidence consists of that organization's agreement with, if not enthusiastic advocacy of, an increase in charges to customers (even beyond that proposed by Ontario Hydro) for the purpose of financing the required system expansion while at the same time significantly improving Ontario Hydro's debt/equity ratio. It is the OMEA's proposal for an explicit capital

contribution, to be included in the cost of power for the purposes of system expansion, that is referred to here.

As for Ontario Hydro's accountability, the OMEA expressed concern that in more than one way Hydro's financial policies constituted a radical departure from the principle of "power at cost" which, it feels, is the touchstone of Hydro as a publicly-owned, non-profit, utility. In particular, the OMEA asserted that the failure to treat the annual provisions for the debt retirement fund and for the Reserve for Stabilization of Rates and Contingencies, as well as the newly proposed system expansion charge, as specific items of cost (with specific purposes), was leading to a breakdown in the concept of "power at cost". The Hydro proposal that a system expansion charge would be totally flexible in its use was said to be contributing to the same "breakdown", and to a diminishing of the municipal utilities' ability to observe where the money is going and to hold Ontario Hydro accountable for its use. In this respect, the ending of the "13th Bill" was opposed by the OMEA as another reduction in Hydro's accountability.

Similarly, in accordance with its desire not to see past principles (as interpreted by it) contravened, the OMEA rejected the application of the rate of return on net assets principle as a criterion of financial performance

and as a means of setting aggregate revenue needs. It feels such a concept is inappropriate, if not meaningless, in Hydro's case. The OMEA objected as well to changes in Hydro's financial policy which could result in an inference that the debt retirement or other reserve charges such as that for rate stabilization and contingencies may be "profits" or "retained earnings" which might potentially be considered taxable rather than capital contributions by its customers. The OMEA insisted it was not simply quibbling over terminology here but that at issue was the basic nature of Ontario Hydro: that it is a cooperative trust of municipalities where power at cost means power without profit.

The second major feature of the OMEA evidence was its support for a capital contribution as a new explicit charge in the cost of power over and above the debt retirement charge (thus maintaining "accountability"). It cites its anxiety over Hydro's rising debt/equity ratio, the reduction in average asset lives, and generally over the declining amount of internally generated capital in proportion to overall projected capital needs. This OMEA recommendation for such a charge is noteworthy in the following respects:

1. It implies considerable support for the general direction in which Hydro wants to move in terms of the

debt/equity ratio, but contemplates even greater reliance on internal revenues to finance system expansion. Indeed, by 1986, the OMEA would like to see the debt/equity ratio reduced to 75/25 from its present 80/20 and the financing of all system expansion out of current revenues within 11 years. The OMEA also believes there should be a progressive increase in the 10½% return on equity until it reaches 15%.

2. So that it is readily apparent where the money is going, the OMEA wants Ontario Hydro's system expansion charge called a "capital contribution to be used for capital purposes". The OMEA feels there are too few restrictions on the uses to which the system expansion charge can be put. It also feels this charge should be kept separate from the one for debt retirement.
3. Unlike Hydro's system expansion charge, the OMEA's "capital contribution" is calculated not in terms of a certain return on equity, (e.g. 10-1/2%), but on the basis of a 75/25 debt/equity ratio.
4. The OMEA also stated that it viewed the capital

contribution as one means of dampening demand for electricity by making people more aware of the great costs of increasing energy demand.

The OMEA voiced concern on other matters relating to Ontario Hydro's financial policies as well. It insisted that to erase the deficit in the direct industrial account would have the inequitable effect of shifting the burden of the deficit to other customer groups who either have paid their way completely or who already have their own deficits to make up. The OMEA recommended that deficits be dealt with in the same way as was the cost of frequency standarization: that they be amortized over not more than five years with interest, and recovered through an explicit charge in the cost of power to the customers involved.

As to depreciation policy, the OMEA stated that it fully supported Hydro's policy. It feels Hydro must have more equity capital and therefore it supports the change to straight-line depreciation on remaining life. It rejected, however, proposals for the application of accelerated depreciation schedules to thermal generating assets.

The Niagara Basic Power Users Committee argued that Hydro's system expansion program would provide generating

capacity greater than Ontario's essential needs. It also claimed that Hydro planned to rely upon CANDU and heavy water production "to an excessive and imprudent degree", and that Hydro's financial analyses did not provide adequate justification for this major investment decision.

It also asserted that Hydro's proposed system expansion charge was not only imprecisely defined and beyond the provisions of The Power Corporation Act, but that it amounted to a hidden tax on electricity to the extent of effectively doubling what the NBPUC calls Hydro's "profit margin". The NBPUC argued that the charge effectively doubled the moneys presently collected through the 40-year, 4% debt retirement reserve and thus doubled Hydro's profit margin from 6% to 12% of total sales revenues.

In general then, the NBPUC did not support Hydro's financial proposals, preferring the alternatives of slower system growth, smaller reserve margins and greater reliance on less capital-intensive fossil generation.

11.9 Views of the Board

Allocation of overheads and capitalization of interest

The Board is in substantial agreement with Hydro on its policies on the classification of expenditures to current operations and capital, but notes that it will wish to

enquire in more detail at a future hearing the matter of establishing the in-service dates of plant and its effect on capital charges. With Board Counsel, we consider reasonable a policy of establishing the interest capitalization rate on the basis of a smoothed approximation of near current costs of borrowing. We believe this will result in a realistic allocation of interest costs between operating and capital account and therefore between current and future customers.

The Board will accept, pending a complete review in a subsequent reference, that overheads are properly capitalized. It was to assure itself that matters such as the capitalization of overhead had been thoroughly considered by the auditors, that the Board requested that Hydro file the report of its external auditors to the Government of Ontario, and this Hydro did, in the summer hearing on the rate increase for 1975. If, at some future time, interest and overhead policies are reviewed by the Ontario Energy Board, it is proposed that Hydro give more details on the question of in-service dates of plant and equipment, as well as the relationship of overheads in the Engineering Branch of the Corporation.

Policy on Depreciation

It is not the Board's intention to provide a definitive opinion on the subject of Hydro's depreciation policy in the present report. Not only has the Board's purview been restricted in the reference to broad policy matters in this area, but further, Hydro has said that its depreciation policies are evolving rather rapidly, and that further studies, relating mainly to changing asset lives but also to other matters are currently under way. Hydro indicated that its study of depreciation policy would include not only a reconsideration of service lives but replacement costs, negative salvage, land, accelerated methods of depreciation, environmental concerns and anything else that impacts on the lives, usage or recovery of costs of power system assets.

The Board intends that any opinion that it gives on the overall adequacy of Hydro's financial policies be qualified by the fact that it has not in this reference given full consideration to depreciation policy and that depreciation represents the largest single item in the financial policy area.

We note also that in his argument Hydro Counsel specifically asked the Board not to reach conclusions regarding

Hydro's depreciation policy until such time as the bulk power rate submission had been considered.

The following, therefore, are some comments on specific matters which arose in the discussion of depreciation policy but are not to be interpreted as an overall assessment of the adequacy or otherwise of that policy. The Board accepts Hydro's basic depreciation philosophy, which it understands to be the recovery of original asset costs, and we endorse the change to straight-line depreciation made by Hydro in 1970 for all major facilities placed on service on or after January 1, 1971, and for all thermal generation stations. Not only is straight-line depreciation much the preferred practice among utilities today, but, as Task Force Hydro noted, with approval, "to the extent that it accumulates funds through depreciation charges in advance of the need to replace the assets involved, these funds become available for financing system expansion. The 'straight line' method ... will increase cash flows from operations so long as the rate of growth of system asset is maintained. This is desirable ... " (Report Number Four, page 30). Although there was not a great deal of evidence on the subject, it became apparent during the hearings that the former method of sinking fund depreciation had resulted in a declining cash flow in relation to asset

growth and new capital requirements for a period going back 20 years or more. This deterioration was caused by the reduction in the average life of assets as more and more thermal generation plants were added to a system of long-life hydraulic assets, compounded by the inflationary impact of new and higher cost plant.

As regards the specific questions on depreciation policy that arose in cross-examination, and in argument, the Board is satisfied that Hydro intends to give appropriate recognition to the suggestions offered. These include the possibility of negative salvage rising from the possibly expensive task of dismantling nuclear plant, a more regular review of asset lives, preferably on a three to five year rotational basis, the depreciation of land and Hydro's estimated service life for heavy water plants.

The Board is fully appreciative of the concern of Hydro's accountants with the proposition that any further consideration be given to replacement cost depreciation. Everyone thinks he knows what "historic cost" represents and there is no doubt that it requires fewer judgmental changes than depreciation charges based on a replacement cost philosophy. It is, however, within the knowledge of the Board that the

British Institute of Chartered Accountants has recommended replacement cost depreciation as appropriate for the nationalized industries and the Board does accept that it tends properly to focus concern on the total cash flows required by an organization. However, this has not yet received wide acceptance in North America. As stated by Dr. Stephen Sherwin before the Ontario Energy Board in the recent Consumers' Gas and Union Gas rate cases, such techniques tend to combine changes in the price level with changes in real costs, including the impact of technological improvements and fortuitous changes in the availability of contractors or construction forces from time to time. Such calculations require the use of numerous subjective assumptions and hypotheses which present considerable obstacles from the viewpoint of administrative feasibility. Our view, is that one can accept the purity of the idea of original cost depreciation and ensure that depreciation rates are adequate, while recognizing the need for increased cash flows by either a rate of return objective or by some other means. This would be the direction that we would think it appropriate to go.

Appropriation for debt retirement and system expansion

The Board is satisfied from the evidence that Ontario

Hydro needs a return greater than that provided for by the debt retirement charge. Hydro itself is strongly of this view, as is the OMEA. There is disagreement, however, as to the concept to be adopted to provide for the additional internally-generated funds. While the OMEA recognizes that even the debt retirement charge is not a cost in the ordinary sense, it is anxious to avoid terminology and accounting treatment that implies that revenues in excess of what are ordinarily considered as costs are profits. The OMEA would prefer that the amounts be regarded as a recovery of capital and treated as a cost. Ontario Hydro has used the terminology "appropriation for debt retirement and system expansion", but hesitated to adopt a clear concept whereby the amount of the appropriation would be determined. In the opinion of the Board, the concept of a return is widely used, even by publicly-owned enterprises and should be adopted by Hydro. Hydro should also establish on a reasonably firm basis a continuing policy that will determine the amount of the return each year. This will be discussed in Chapter 13.

The Board has no opinion on the legality of Hydro's proposed appropriation for debt retirement and system expansion. We note that it is Hydro's intention to seek an amendment to The Power Corporation Act, if that is necessary.

The Board notes that Hydro proposes to eliminate the Reserve for Stabilization of Rates and Contingencies. Whereas the rate stabilization reserve was in the nature of a revenue reserve, it seems to the Board that by virtue of its name, treatment in the accounts, and investment of the amounts created in plant, the new Accumulated Equity account is considered by Hydro to be a capital reserve.

Despite the general criticism of the rate stabilization reserve, centering on the fact that to some it had been allowed to build up to excessive levels and that until recent years it had been invested totally in liquid assets, it is most surprising to find that Hydro now appears to consider it totally unnecessary to identify any reserve for the purposes previously designed, or to identify in the liquidity section of its submission, any portion of liquidity with rate stabilization and contingency purposes. Hydro says in its submission that the new appropriation will eliminate the need for a separate provision for rate stabilization because it considers "total requirements". Furthermore, "major financial gains or losses will be dealt with as special situations and eliminate the need for the separate contingency reserve."

The Board cannot understand why having gone so far in the direction advocated by Task Force Hydro, the Hydro Board does not go all the way. Recommendation 4.6 of the Task Force reads:

"The current charge to the cost of power for debt retirement be replaced by a charge sufficient to meet the requirements of the Corporation for internally generated funds for debt retirement and system expansion."

This Hydro has done. Recommendation 4.7 reads:

"There be established on the balance sheet an 'Accumulated Equities' account to replace the current 'Equities Accumulated through Debt Retirement' charges and a 'General Reserve' account to replace the 'Reserve for Stabilization of Rates and Contingencies'."

Hydro has implemented the first half of this recommendation but, instead of creating a General Reserve, which the Task Force appeared to consider as equivalent to a Retained Earnings account, Hydro seems to have substituted its Surplus (Deficit) account, designed to be zeroed out every three years. The Task Force explained that the size of the General Reserve would be maintained "in accordance with the Board's assessment of future risk" for rate stabilization and contingencies, and that any surpluses would be capitalized,

i.e., transferred to the Accumulated Equities account from time to time." The Board feels that the Task Force proposal would be a less drastic departure from the conventional financial practices, would provide more reasonably for the legitimate purposes of rate stabilization and contingencies, and, especially if the General Reserve was simply renamed "Retained Earnings", would accord more completely with generally accepted accounting principles.

The Board is concerned with the OMEA proposals for a system expansion charge with respect to both the approach and the result. The OMEA proposes that Hydro attempt to reduce the debt ratio by 1986 to something in the order of 75 per cent, which would have the incidental effect of producing a rate of return on equity that would approach 15 per cent. The Board finds this to be a high return even for a well-financed privately-owned utility and considers further that establishing an objective in terms of an arbitrary balance sheet ratio is less satisfactory than attempting to achieve an appropriate rate of return as the primary objective.

As will be clearer in Chapter 13, it is the Board's view that the adoption of rate of return as proposed by Hydro is an appropriate means of determining the annual charges to be transferred to the equity account.

Policy on accumulated customers' equity

Hydro's new policy of granting the municipal utilities and the power district an accumulation of equity on the basis of their contributions for both debt retirement and system expansion in the same manner as debt retirement charges have been apportioned in the past is acceptable to the Board. It is noted that this also accords with a proposal in the fourth report of Task Force Hydro. The Board accepts the statement of Board Counsel that the ownership of equity in Ontario Hydro is a non-issue in these hearings. We do not believe that any change that Hydro is proposing in its policy on equity relates directly or indirectly either to the ownership of the equity in Ontario Hydro or to its accountability.

Revenue Smoothing

Under this heading, Hydro discussed the recovery of certain deficits standing against the direct industrial and retail customers, which had accumulated up to December 31, 1973, as well as the operation of the new accumulated surplus and deficit accounts. The Board does not accept at this time the Hydro proposal with regard to the recovery of the accumulated Power District deficits. In order that it may reach a decision on this matter the Board will require a complete history of the deficits, why and by whom

they were incurred and a detailed statement of transfers from or into the reserve accounts of Hydro resulting from the movement of industrial and rural retail customers from or into the Power District. For this reason, the Board recommends that the recovery proposed should not proceed in 1975. The Board also reserves its judgment on the question of the rolling forward of revenue requirements over a three-year period. This matter was dealt with in much greater detail in the summer hearing on the 1975 rate increase and was also at that time subject to much more complete testing by cross-examination and interventions.

Terminology

The Board is pleased to note that Hydro has made a number of changes in terminology in its financial statements which should assist measurably to improve the level of public understanding of Hydro's reports and statements.

The Board's major concern remains with the new appropriation for debt retirement and system expansion. As we stated earlier, we have some concerns that the name of the new appropriation suggests a capital purpose which will tend to tie Hydro's hands in terms of legitimate uses of the reserve for stabilizing rates and providing for foreign exchange risks, contingencies and general liquidity requirements. The Board agrees with the purpose of the

appropriation and we accept the need for an increase in internally generated funds beyond that provided by the debt retirement charge. However, we think it desirable to avoid any implication that these funds can only be used for capital purposes and not for other legitimate requirements of the Corporation in what we see to be a difficult financial environment ahead. The Board feels that Hydro should review the advantages of having a general or revenue reserve along the lines proposed by Task Force Hydro. If it were then to call it "Retained Earnings", it would at the same time accord with the expressed desire of Hydro for a nomenclature which is generally understood and accepted in the financial community.

Interestingly enough, the term "Statement of Retained Earnings" appears in the 1973-1977 Financial Plan, tabled by Hydro as Supplement 5.0-1 of its main submission. The term has not appeared, however, on any published financial statements of the Corporation.

FINANCING POLICIES

12.1 Capital (Borrowing) Requirements

Ontario Hydro made it clear that its proposed capital construction program will lead to a very significant increase in its need for borrowed capital even with the proposed increases in internally-generated funds. Evidence tabled at the hearing indicated that total capital requirements will rise from \$890 million in 1974 to \$3,987 million in 1986, for a total of over \$30 billion in the 12-year period. These data appear in this report in column 6 of Table 1, Chapter 7, and in row 39 of Table 4. The average annual increase in required funds over the period 1976-1986 is approximately 13%. Hydro estimates that debt financing will account for 71% of total capital requirements over that period.

Line 59 of Table 4 presents Hydro's forecast of annual borrowing requirements over the same period. They are shown rising from \$770 million in 1974 to \$2,964 million by 1986. These amounts arise from adding cash operating costs and capital costs (lines 38 and 39), deducting revenues (line 42) and then providing for funds required for debt maturing and debt retired before

ONTARIO HYDRO
Summary of Revenue and Cost Statement

\$ - Millions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
14 <u>Revenue</u>													
16 <u>Primary</u>	912	1,123	1,369	1,648	1,980	2,383	2,510	2,849	3,221	3,623	4,093	4,700	5,302
17 <u>Secondary</u>	82	82	62	48	33	17	0	0	0	0	0	0	0
	<u>994</u>	<u>1,205</u>	<u>1,431</u>	<u>1,696</u>	<u>2,013</u>	<u>2,400</u>	<u>2,510</u>	<u>2,849</u>	<u>3,221</u>	<u>3,623</u>	<u>4,093</u>	<u>4,700</u>	<u>5,302</u>
21 <u>Costs</u>													
23 <u>Variable</u>	245	339	421	513	617	721	773	827	885	946	1,038	1,142	1,241
24 <u>Committed</u>	348	389	457	571	628	734	819	967	1,133	1,323	1,529	1,797	2,091
25 <u>Controllable</u>	281	317	394	470	546	633	642	742	852	964	1,059	1,263	1,425
	<u>874</u>	<u>1,045</u>	<u>1,272</u>	<u>1,554</u>	<u>1,791</u>	<u>2,088</u>	<u>2,234</u>	<u>2,536</u>	<u>2,870</u>	<u>3,233</u>	<u>3,656</u>	<u>4,202</u>	<u>4,757</u>
29 <u>Net Earnings</u>	120	160	159	142	222	312	276	313	351	390	437	498	545
31 <u>Debt Retirement</u>	70	76	84	96	109	125	131	152	176	199	227	265	298
32 <u>System Expansion Charge *</u>	50 *	84 *	75 *	48 *	113 *	157 *	144	161	175	190	210	231	248
35 <u>Operating Costs</u>	874	1,045	1,272	1,554	1,791	2,088	2,234	2,536	2,870	3,233	3,656	4,202	4,757
36 <u>Less: Total Depreciation</u>	(153)	(170)	(196)	(234)	(283)	(342)	(349)	(427)	(519)	(572)	(692)	(823)	(911)
38 <u>Cash Operating Costs</u>	721	875	1,076	1,320	1,508	1,746	1,885	2,109	2,351	2,661	2,974	3,379	3,846
39 <u>Capital Costs</u>	590	1,112	1,368	1,805	1,891	2,072	2,276	2,538	2,716	3,043	3,464	3,771	3,957
41 <u>Total Cash Costs</u>	1,611	1,987	2,444	3,125	3,399	3,818	4,161	4,647	5,067	5,704	6,438	7,150	7,803
42 <u>Less: Revenues</u>	(994)	(1,205)	(1,431)	(1,696)	(2,013)	(2,400)	(2,510)	(2,849)	(3,221)	(3,623)	(4,093)	(4,700)	(5,302)
44	617	782	1,013	1,429	1,386	1,418	1,651	1,798	1,846	2,081	2,345	2,450	2,531
45 <u>Add:</u>													
46 <u>Debt Maturing</u>	113	77	177	145	227	156	107	101	58	191	185	91	31
47 <u>Debt Retired</u>	70	76	84	96	109	125	131	152	176	199	227	265	298
48 <u>Other</u>	(25)	110	108	47	45	18	35	49	(15)	128	43	51	104
50 <u>Salvage of Investments</u>	795	1,045	1,382	1,717	1,767	1,717	1,924	2,100	2,065	2,599	2,800	2,400	2,464
51 <u>Total Borrowing Requirements</u>	(25)	(45)	(32)	(17)	(17)	(17)	(18)	(12)	(12)	(12)	(7)	0	0
53	770	1,000	1,350	1,700	1,750	1,700	1,906	2,088	2,053	2,550	2,793	2,807	2,800
55 <u>Total New Debt</u>	700	900	1,150	1,400	1,650	1,750	1,733	1,898	1,866	2,352	2,539	2,634	2,695
56 <u>Change in Notes</u>	70	100	200	300	100	(50)	173	190	167	235	254	263	260
58	770	1,000	1,350	1,700	1,750	1,700	1,906	2,088	2,053	2,550	2,793	2,807	2,800

Figures may not add exactly due to rounding.

Source: Ontario Hydro, Transcript Vol. 55, May 21, 1974, p.7468

* includes surplus or deficit resulting from revenue smoothing

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maturity (lines 46 and 47), funds obtained from the sale of investments (line 51) and an item marked "other".

Board Counsel questioned Hydro's practice of adding to its borrowing requirements an amount (line 47) equivalent to the debt retirement moneys available to it by formula (line 31). He was of the view that such re-financing constituted "simply paper trading" rather than a genuine cash requirement (Transcript p. 7223). Hydro's answer was that not only is debt retirement a statutory requirement, and therefore a cash requirement, but also that debt retired will likely involve different groups of creditors than new debt issued and, therefore, is more than a simple exchange of paper. The Treasurer explained that line 47 means that the sinking fund moneys that are available for retirement of debt are utilized in the open marketplace to retire debt as necessary to support the market for Hydro issues, and that the maximum amount that is available in the sinking fund is earmarked for this purpose, though not always used.

Hydro said that the forecast capital program will require that Ontario Hydro's net new total debt requirement

will increase from 1.8% of total gross Canadian savings in 1953-1972 to some 3% in the 1973-1986 period. It will be necessary, Hydro said, for it to absorb a larger proportion of Canadian savings than in the past, or even than Dr. Neufeld had projected in his studies for Task Force Hydro only two years ago. Whereas Dr. Neufeld estimated that Hydro's gross new total debt requirements would total a little over \$13 billion between 1973 and 1986, or 2.2% of total gross Canadian savings, Hydro's current figures show that the debt requirement will be almost \$24 billion, or 3% of total savings over that period.

Hydro also tabled a summary of the report, An Energy Policy for Canada, of the federal Department of Energy, Mines and Resources. Estimates derived from the CANDIDE model indicate that, under an extensive development hypothesis, total capital investment in the energy sector could amount to \$60 billion in current dollars over the period 1971-1980. This would require a 13.5% average rate of growth in total energy-sector capital requirements over the decade, compared to the historical growth rate of 10.7%. In addition to these potential demands for capital, Hydro said, there are

continuing demands from other important sectors, such as residential construction and government investment, which are unlikely to diminish in the future. Because of the considerable pressure expected on Canadian capital markets, Hydro said that the problem of raising capital will be more difficult than in the past. To this end, it is re-examining its policies with respect to the design, mix and marketing of its securities, a matter to which we now turn.

12.2 Capital Availability and Debt Marketing

In arranging for the financing of the proposed capital construction program, Hydro said that it plans to adhere to certain basic policies and guidelines, subject to exercising a reasonable degree of judgement according to the circumstances. The policies and guidelines are:

1. Assets having a long life should be financed primarily by long-term debt. Some short-term financing is appropriate where it will reduce average interest cost. The Treasurer defined long-term debt as having a maturity of twenty years or longer, intermediate-term debt 11-19 years, short-term bonded debt 5-10 years and short-term notes 30 days to 3 years. He said that Hydro had before the Government a request for authority to expand its short-term note operation up to 5 years maturity.
2. To avoid exchange rate fluctuations, the joint provincial and Ontario Hydro financial requirements should be arranged in the Canadian market to the fullest extent possible, consistent with market stability.

3. To finance requirements not covered by Canadian borrowing, Ontario Hydro should resort first to the U.S. capital markets and then to other foreign markets. Hydro said that it can negotiate 30-year debt quite readily in large amounts in the U.S. By contrast in the European markets that Hydro has used so far, not only must Hydro enter a queue making it difficult to estimate when the issue will be marketed, but also the financing expenses are large relative to North America. The Treasurer indicated that he could not expect to float an issue outside of Canada and the U.S. for more than about \$40 million and would not rely on these markets for more than 10% of total borrowing requirements.
4. Hydro said that it intended to make greater use of foreign markets (outside Canada and the U.S.) where appropriate and to encourage the opening of additional foreign markets. The Treasurer said that Hydro had borrowed in three European markets, the Eurodollar, Deutschmark and Swiss franc markets. Ontario Hydro has appointed a syndicate manager for the French market and the Province of Ontario has one for the Japanese market.

5. Ontario Hydro maintains close contact with the Province of Ontario in carrying out its capital borrowing program.

In Canada, borrowings are by Ontario Hydro with the guarantee of the Province. In the United States, borrowings for Hydro are by the Province which turns over the proceeds to Hydro.

Hydro explained that its financing program is developed in the Treasury Division in February each year, sent for approval to the Hydro Board and subsequently used, in consultation with the Province, to determine specific requirements for Ontario Hydro and for the Province. Details of the joint Hydro/Government financing agreement are submitted to the provincial Treasurer. The approval process takes some four months, the major uncertainty being that approval cannot be reached until the Ontario budget is brought down.

Hydro's Treasurer explained that the major difference between the Canadian and American financings in the matter of preliminary procedures is the intervention of the Securities and Exchange Commission in the United

States. Canadian issues are preceded only by the publication of an offering circular, whereas U.S. issues must be accompanied by a full prospectus approved by the S.E.C. The Treasurer explained that the process of negotiating a Canadian bond issue begins with evaluation of the state of the market, the likely price of the issue, how investors are reacting and how outstanding issues are performing. Regular meetings are held with staff of the finance group in the Ministry of Treasury, Economics and Intergovernmental Affairs of the Province. When the specific timing and requirements for the issue are established, the proposal is submitted for approval to the Board of Hydro and to the Provincial Treasurer. The terms can be negotiated very quickly then with the syndicate members and then ratified by the two principals. The final step, normally a formality, is obtaining an Order-in-Council approving the issue. The Treasurer said that there is a firm underwriting for 100% of each issue, which is distributed through a large syndicate. Hydro does not receive any commitment as to the final distribution of the bonds but does receive a record after the issue showing what each syndicate member did with the percentage of the bonds he received and also details of post-sale trading activity.

Hydro's Treasurer said that since 1946 the syndicate managers in Canada have been McLeod, Young, Weir & Company Limited.

He said that acting on a recommendation of Task Force Hydro, the Province and Hydro have undertaken a review of the performance of the individual syndicate members and are now assessing the results of the survey they have undertaken.

In the United States, the Province and Hydro share a joint managership of Wood, Gundy & Company, representing the Canadian content, and Salomon Bros., representing the American content. The Canadian content of the U.S. syndicate consists of Canadian dealers having offices in the United States and conducting business there.

Dr. W. Fruehauf, an energy economist retained by Hydro, gave evidence that there is a high degree of volatility in the total level of lending and borrowing in the Canadian economy. This volatility is reflected

in the provincial and provincially-guaranteed bond sector, he said, but the swings in this sector are usually not so severe as in other sectors. He said that transfers of capital to the provincial governments through purchases of provincial bonds by the Canada Pension Plan totalled \$5.4 billion over the period 1965-1972. He expected the flows of funds from the Canada Pension Plan to begin to level off as the fund matures and he concluded that Ontario Hydro cannot in future rely on the transfer of such funds to reduce the competition from provincial governments for available funds in the capital markets.

Hydro witnesses, on examination by Board counsel, testified that the Provincial Government has not been in competition with Ontario Hydro in the long-term capital markets to a significant degree in recent years except during 1972-1973 when its borrowings were used mainly to build up liquid reserves. It appeared that this is not only because of very large flows from the Canada Pension Plan but also because of the Province's ability to borrow funds from the Ontario Municipal Employees' Retirement Savings Plan and the Teachers' Superannuation Fund. Total flows from the three sources have grown rapidly during the late sixties to the billion dollar level. While there is evidence that the funds

from these sources will continue to grow for a few years, there are two reasons why the monies might not continue to be available to the Province in the same amounts. The first is that the C.P.P. funds are expected to level off, and the second that the administrators of the OMERS fund, and possibly the Teachers' fund, are dissatisfied with the return earned on funds lent to the Province and may attempt to balance their portfolios differently in the future.

Table 5 following is based on a Board staff exhibit and summarizes the borrowing requirements of the Ontario Government to 1981 on the assumption that the Province's share of total available (domestic plus foreign) savings remains at 3%-4%. Projections of the combined Ontario Hydro and provincial new public borrowing requirements were presented to the Board, as follows:

TABLE 5

FORECAST ONTARIO GOVERNMENT REQUIREMENT FOR MARKET FUNDS 1974-81
(\$millions)

	ONTARIO GOVERNMENT SHARE OF SAVINGS		C.P.P. FUNDS	INTERNAL FUNDS	TOTAL	SECURITIES TO BE SOLD IN THE MARKET	
	3% Total Gross Canadian Savings	4% Total Gross Canadian Savings				Low	High
	(1)	(2)	(3)	(4)	(5)	(1-5)	(2-5)
1974	923	1,231	686	255	941	-18	290
1975	994	1,326	727	276	1,003	-9	323
1976	1,068	1,424	718	298	1,016	52	408
1977	1,142	1,523	695	322	1,017	125	506
1978	1,227	1,636	658	348	1,006	221	630
1979	1,317	1,756	606	375	981	336	775
1980	1,412	1,883	538	404	942	470	941
1981	1,513	2,017	454	435	889	624	1,128
1982	1,620	2,160					
1983	1,733	2,311					

(\$ Millions)

<u>ONTARIO HYDRO</u>	<u>PROVINCE</u>		<u>TOTAL</u>	
	<u>Low</u> (2)	<u>High</u> (3)	<u>Low</u> (1+2)	<u>High</u> (1+3)
(1)				
770	-	300	770	1,070
1,000	-	300	1,000	1,300
1,350	50	400	1,400	1,750
1,700	120	500	1,820	2,200
1,750	220	600	1,970	2,350
1,700	340	800	2,040	2,500
1,910	470	950	2,380	2,860
2,090	620	1,100	2,710	3,190

Projections of Ontario Hydro's requirements are from line 53 of Table 4, as rounded to the nearest \$10 million. High and low estimates of provincial public securities offerings are taken from Table 5 as rounded. Board Counsel put it to Hydro witnesses that these forecast of public securities offerings by the Province could prove low if benefits payable under the Canada Pension Plan continue to increase at a faster rate than contributions or if the "internal" retirement plan funds are diverted more rapidly than anticipated to

alternative investments bearing a higher return.

Hydro's reply was that Board Counsel's forecasts of the Province's competition for funds in the public marketplace were both speculative and probably pessimistic. Hydro pointed out that Task Force Hydro said that its own estimates and those of Dr. Neufeld of provincial borrowings and of future flows of internal funds and C.P.P. funds, on which Table 5 was based, were only rough approximations. Hydro said that the Ontario 1974/75 budget indicates an intention to retire some \$450 million dollars in outstanding public debt which "will relieve pressure on Canadian Capital Markets and provide borrowing capacity for Ontario Hydro, private sectors and local Government financing." (Transcript p. 7490-91). Hydro said it was inappropriate to speculate about the future investment policy of the OMERS and Teachers Superannuation funds, but even if funds from such sources cease to be available to the Province, the overall availability of capital is not decreased and there is no net effect on the capital markets.

In discussing the capital markets available to the Province and to Ontario Hydro, Hydro made reference to a table reproduced here as Table 6 which it characterized as "only one of a number of alternative combinations

ONTARIO HYDROBorrowing Estimates 1974-1986

<u>Year</u>	(1) <u>Net(A) Borrowing Requirements</u>	(2) <u>Canadian(B) Bond Market</u>	(3) <u>U.S. Long Term Bonds</u>	(4) <u>Other Foreign</u>	(5) <u>Short(A) Term Notes</u>	(6) <u>U.S. Private Placements</u>
1974	770	375	250	75	70	-
1975	1,000	425	300	85	100	90
1976	1,350	475	375	100	200	200
1977	1,700	525	425	115	300	335
1978	1,750	575	475	130	100	470
1979	1,700	625	550	145	(50)	430
1980	1,906	685	600	160	175	285
1981	2,088	745	675	175	190	305
1982	2,053	815	725	190	185	140
1983	2,587	895	800	205	235	450
1984	2,793	975	850	220	255	495
1985	2,897	1,065	925	235	265	405
1986	2,964	1,165	975	250	270	305
TOTAL	\$25,558	\$9,345	\$7,925	\$2,085	\$2,295	\$3,910
PERCENT	100%	36.6%	31.0%	8.1%	9.0%	15.3%

(A) Based on November 1973 escalation and March 1974 interest rates.

(B) Bonds of 5 years and longer.

Source: Ontario Hydro, Transcript Volume 55, May 21, 1974 p.7474.

available for financing (which) can and will probably be changed" (Transcript p. 7475). Column 1, Net Borrowing Requirements, is taken from line 59 of Table 4. Column 2, Canadian Bond Market, includes the long-, intermediate-, and short-term bond market as earlier described. According to Hydro's Treasurer it represents Hydro's first priority in financing: "I would like to go on the record that if I could borrow all the money for this organization in the Canadian market anywhere from 5 to 30 years I would do it" (Transcript p. 7476).

Hydro said that the estimates in Column 2 are conservative in that they represent the lower estimate of capital available as provided in evidence by McLeod, Young, Weir and Co. Ltd., Hydro's Canadian syndicate managers.

Column 3 is an estimate of funds available to Hydro in the United States long-term bond market. Column 4, Other Foreign, represents anticipated financings in foreign markets other than the United States. Such financings account for approximately 8% of total requirements, which is in line with the Treasurer's estimate that he expects other foreign markets to provide between 5% and 10% of total funds in the future. Hydro's estimate of the amount to be financed by short-term notes of \$2.3 billion is

significantly less, Hydro said, than the \$6 to 7½ billion which could be financed in that sector if absolutely necessary. This will be discussed further below.

Column 6, entitled U.S. Private Placements, represents the residual requirements after the Canadian bond market, the U.S. long-term bond market, other foreign and short-term note estimates are deducted from total requirements. This market is as yet untested by Hydro and was the subject of considerable discussion in the hearings.

Summarizing the evidence of the Hydro financial witnesses and the two syndicate managers on the issue of capital availability, Hydro Counsel said that the Corporation has been widening its sources of capital and the range of its bond maturities in order to raise the large amounts of capital required and also to be able to operate with as much flexibility as possible in the face of the changing market conditions. To this end he said that:

1. Hydro has been making increasing use of the intermediate- and short-term Canadian bond market in recent years.
2. In conjunction with the U.S. syndicate managers a beginning has been made in broadening the U.S. market for provincial issues.
3. Since 1969 Ontario Hydro has negotiated six issues in Europe.
4. Since 1965 Hydro has successfully tested the Canadian short-term note

market. The Ontario Government recently lifted Hydro's borrowing ceiling to \$500 million. 5. In line with an observation of Task Force Hydro that Hydro should take an even more detailed interest in the marketing and trading of the debt issues than it has in the past, Hydro has upgraded its Treasury staff through the hiring and development of more technical expertise "to ensure Treasury will possess the necessary skills from a variety of fields to meet the challenges of an expanding financing program" (Transcript p. 7479-80).

The several hundred pages of testimony on the subject of capital availability may be summarized as follows:

1. Ontario Hydro is able to borrow at better rates and in larger amounts than any other credit in Canada with the exception of the federal government.
2. According to Hydro's Canadian syndicate managers, because of the need to space out issues, Ontario Hydro and the Province combined should go to the market no more than five times a year. In recognition of the relative size of their public

borrowings (tabulation page 151) Hydro would normally take four of the five slots, and if it was so agreed between the parties and the Province did not need it, the fifth slot could also be available to Hydro.

3. In each Canadian issue of five years' maturity or longer, Ontario Hydro could expect to raise at reasonable rates between \$75 and \$125 million. A total amount of \$400-450 million in 1974 could reasonably be expected.
4. The willingness of Hydro's Treasurer to rely, if necessary, on financing by short-term notes in amounts as large as \$6-7½ billion was subjected to criticism by Board Counsel. The factual basis for such a view is weak and the implications have not been fully considered, Board Counsel alleged. Board Counsel pointed out that Hydro's experience in the short-term note market has been limited

to \$250 million and the problems of managing a money market operation larger than some banks, without impinging on Hydro's traditional sources of funds, would be very great indeed. Hydro's reply was that it intends to use that note market only as a last resort, and only to the degree approved by the province.

5. As to the Canadian private placement market, the Canadian syndicate managers did not consider it to be a good source of additional financing. They felt that this type of financing would only raise a marginal amount of funds, most of which would simply come from Hydro's traditional lenders at a higher rate. On the other hand, the U.S. syndicate managers thought that the Government of Ontario, on behalf of Hydro, might very well pursue both the short-term bond and private placement markets in the United States, since in the U.S. they would not likely involve

the same pension funds and institutions that purchase the bulk of long-term Ontario issues. In the last moments of the hearing, Hydro tabled a letter from Salomon Bros., one of the U.S. syndicate managers, indicating that the U.S. private placements sector could provide between \$300 million and \$500 million a year to the Government of Ontario for Hydro. There was no opportunity for the Board or its counsel to question this opinion as it was filed after the writer of the letter had concluded his oral testimony and returned to the U.S. The witness had, however, testified that "this (the private placement market) is another vast area which we have not really tapped yet as far as Hydro's requirements are concerned."

6. As regards offshore borrowing, Hydro's Treasurer said that in addition to the European markets which Hydro has already begun developing, attention is turning to Puerto Rico and Japan. But he said that the amounts raised in any one such issue would not likely exceed \$25 million or \$35

million and the maturity would be no more than fifteen years. Furthermore, the queue requirements cause delay and uncertainty and the commission fees are approximately double those pertaining in North America.

7. Board Counsel stressed the importance of direct communication and co-operation among Hydro, the provincial government and the federal government with respect to the planning and managing of the debt obligations of Hydro, having regard to their importance and to the implications of exchange rates and the balance of payments. Hydro said that it preferred to leave its relations with the federal government largely in the hands of the provincial government, acting on its behalf.

12.3 Financial Integrity, the Provincial Guarantee and the Debt/Equity Ratio

The question of Hydro's financial integrity, how it is affected by the provincial guarantee of Hydro's debt, and the significance of indicators such as the debt/equity ratio appeared and reappeared throughout the testimony on the subject of financing policies.

Hydro said that the maintenance of financial integrity was one of the three underpinnings of financial planning in Ontario Hydro and equated it in importance to the question of the capital availability and impact on power costs. Hydro said that it has been the traditional financial soundness and strength of the Corporation, together with the provincial guarantee, which has accounted for its historic ability to attract capital on reasonable terms. Hydro said that the provincial guarantee will continue as valuable support to Hydro's issues in future but given the size of its future borrowing program (Table 6), and the expected competition in the capital markets, Ontario Hydro believes more than ever it is important today that it preserve "a sound financial structure" and "the integrity of the organization in the investment community".

Hydro said that the most important standards of financial integrity are a suitable debt/equity ratio, an ability to cover interest and debt repayments and a satisfactory return on investment. In addition to its financial integrity, Hydro said that there were

four other factors that could affect its cost of borrowing:

1. The relative security that Hydro's debt instruments are capable of offering in light of alternative investment opportunities.
2. The impact of Ontario Hydro's requirements for capital on the supply and demand for funds in the capital markets.
3. The relative saturation of the market with outstanding Hydro issues.
4. The politico-economic climate in both the short and long term.

In its submission Ontario Hydro said that over the last few years Hydro Quebec and B.C. Hydro, both of whose bond issues carry a provincial guarantee, experienced improvements in their debt ratios. By contrast, Hydro's debt ratio worsened between 1967 and 1972 to the point where it is now at least eleven percentage points above the highest debt ratio of five major investor-owned Canadian utilities with which comparisons were made. Hydro said that it shares with

a group of major U.S. utilities a common rising trend in their respective debt ratios, but that Hydro's was higher than all the American utilities save only TVA. Hydro said that its interest coverage ratio has decreased over the period 1960 to 1972 as well.

Hydro said that despite these worsening indicators of financial performance, there is no indication yet that Ontario Hydro's borrowing ability has been detrimentally affected. But it predicted that in coming years, lenders can be expected to look through the provincial guarantee to the financial structure and performance of Hydro and rate Hydro's securities in accordance with the standard tests.

The testimony of the financial advisors made it clear, Hydro said, that the maintenance of financial integrity is important even given the provincial guarantee. Salomon Bros. testimony was that:

"It may be argued that there is no need for Hydro to meet the traditional standards of financial integrity, since it finances its capital requirements under the guarantee of the province. This is an unsound approach for the simple and compelling reason that Hydro's borrowings now constitute the bulk of provincial long-term debt.... The important point to be

derived from this comparison, however, is that Hydro on its own, that is without the provincial guarantee, would have difficulty in effectively competing for funds in the United States. Moreover, should the provincial credit become marginal, it is likely that where the province was borrowing on behalf of Hydro, lenders would look through the provincial guarantee at the credit worthiness of the Hydro's operation, inasmuch as the funds borrowed by the province are being passed down to Hydro and Hydro bonds are taken back by the Province" (Transcript pp. 7463-64).

The thorough examination of Hydro's witnesses by Board Counsel made it clear, he maintained, that the financial integrity of Hydro cannot be measured, except in the most general way, by the use of the standards applicable to investor-owned utilities. He said that Hydro

"argues that financial integrity is next to the highest virtues of life itself and yet, when you really come down to it, it means nothing more than a lot of arguments by which you justify what you already have decided to do in the first place ... You can apply a dozen standards and call them anything you want, whether it is assets coverage, debt/equity ratio, return on equity, return on gross assets or return on net assets. It all comes back to common sense.... In short, are you running a good ship? That is really what financial integrity means" (Transcript, pp. 7304-06).

Quoting a long exchange with Hydro's Vice-President, Finance on the importance of the various measures of financial integrity, Board Counsel concluded that the exchange revealed that Hydro was looking for a certain amount of money and having decided that was what it needed to raise

"the whole team then sat down and said in effect to itself, 'now with that amount of money coming in have we satisfied... the tests (of) financial integrity'" (Transcript p. 7308).

He said that as far as the debt/equity ratio was concerned it was clear that the financial advisors thought it was important but that under close cross-examination they backed away from the strong statements in their written submissions to the point of admitting that perhaps the debt ratio could rise to the 90% area before it would really be worrisome.

12.4 Liquidity Policy and the Treasury Function

Hydro summarized its position on liquidity as follows:

"Ontario Hydro believes that it is essential to maintain a level of liquidity that will ensure a normal payment of its expenses and that will offer the needed flexibility to allow Ontario Hydro to adjust its borrowing program, if necessary, to changing capital market conditions. The establishment of a suitable level of liquidity is believed to be a matter of business judgement."
(Transcript pp. 7496-7497).

Hydro said that the basic level of liquidity should cover its cash obligations, with the exception of debt repayments, for at least one month and should also provide an amount approximately equal to the proceeds of one Canadian bond issue to provide a cushion against unexpected or unsatisfactory developments in world capital markets as well as to provide some flexibility in arranging debt financing. The former amount Hydro defined as monetary liquidity, which is related to a need to meet current obligations; the latter, capital liquidity which is needed to meet maturing long-term obligations of the Corporation and the management of the in-flow and out-flow of capital.

Hydro said that although it maintained lines of credit with the major Canadian banks totalling \$85 million, it is cheaper to borrow by way of short-term notes than to use its "over-draft" privileges. Hydro said that it prefers to regard the bank lines of credit as a backup to its overall note program.

Interspersed with the examination of Hydro's liquidity policy were a number of references, mainly by Board Counsel, to the subject of Treasury operations in general. These concerns may be conveniently summarized under five headings:

1. On the subject of Hydro's debt retirement program, Mr. Macaulay was most concerned that Hydro appears to follow a program of issuing debt securities in advance of its actual need for the funds to finance capital expenditures. The surplus funds he said are then used by Hydro's Treasurer either to re-invest in short-term notes until needed, to purchase unmaturing Hydro securities in the open market, or to maintain target liquidity levels. He said he had not been convinced that Hydro's program of entering the secondary market to purchase its own issues was a prudent policy and

stated that he did not know of any other large well-rated utilities that kept such large amounts of funds at their disposal for open-market operations rather than investing them in productive plant facilities.

Hydro's reply was that the evidence of its financial witnesses had made it clear that Hydro's debt marketing program has resulted in a reduction in interests costs ranging up to 20 basis points, or savings of some \$3.5 million over a ten-year period. Hydro said that the criticism of the practice of borrowing ahead of requirements ignores the realities of the marketplace and that given Hydro's clearly demonstrated need for capital funds, the Corporation must have the flexibility to time its issues to take every possible advantage of financial markets. Board Counsel, said Hydro, recognized this himself in his statement that "there is an old phrase on the street, 'get it where you can when you can get it'." (Transcript p. 5195).

2. Board Counsel said that Hydro appeared to follow a policy of leaving the proceeds of foreign issues in foreign currency, thus incurring "simply immense"

exchange risks. Hydro said that the proceeds of U.S. issues are left in the U.S. in sufficient amounts to pay bond interest, retire maturing debt and meet invoices from coal and transportation suppliers. Its policy is to use U.S. funds to pay U.S. obligations and meanwhile to invest spare funds at appropriate interest rates to meet the cash needs of the organization. This policy is not followed in other foreign countries save for one exception in which Hydro left the proceeds of the Deutschmark issue in Germany and successfully speculated on an upward revaluation of the mark.

3. Board Counsel was critical that Hydro's short-term note program, which Hydro's Treasurer said could be expanded almost without limit if necessary, could in fact be quite costly, not only because of the cost of administering the program but also because of the significant spread between interest paid on the notes and the interest earned on short-term investments.

Hydro Counsel dealt with this by saying first of all that it is fallacious to confuse the two programs, since they have distinctly separate objectives. Short-term debt issues supplement long-term borrowings

and help reduce overall interest rates. Short-term investments, on the other hand, are the means by which Hydro disposes of temporary surpluses of cash pending their disbursement to cover expenses or to pay for plant. The source of these funds cannot be traced to the short-term note program or, for example, to the revenues from power sales. The amount and terms of short-term investments are determined by liquidity policy and cash flow and are not related to Hydro's borrowing program.

4. Board Counsel recommended that Hydro accelerate the disinvestment of the rate stabilization reserve beyond the \$40 million to \$60 million per year pace proposed by Hydro. This, he said, would reduce the amounts required under the system expansion charge and have an immediate beneficial effect on rates. Hydro said that the funded reserves are held mainly in long-term issues and a too rapid disinvestment could lower bond prices and impinge on Hydro's own borrowing program.
5. Board Counsel expressed a general concern that Hydro was expanding its Treasury operations into areas that more properly belong to the provincial Treasury

officials, in light of the fact that it is the provincial credit that is at stake. Board Counsel said it is much to be preferred that the primary responsibility rest with the provincial Treasury which is responsible through a Minister of the Crown to the Legislature. Hydro acknowledged that the operations of Hydro have an enormous impact on the financial health of the Province, but said that the constant and close co-operation of Hydro and the Province insured that there can be no inconsistency in the objections of the two organizations in the financing area. Hydro reminded the Board that Task Force Hydro was strongly of the view that Ontario Hydro should retain its financial independence and responsibility.

12.5 Views of the Intervenors

In Chapter 11 on financial policies, reference was made to the OMEA's concern for Ontario Hydro's declining debt/equity ratio. Little can be added here except to reiterate that the OMEA made it clear that it looks forward to a lower debt/equity ratio in the future and a greater reliance on current revenues to finance expansion. It feels its proposal for a capital contribution,

with the reduction of borrowing it involves, is a proper "counter force" against inflation. It rejects the proposal that the province purchase preferred shares in Ontario Hydro on the grounds that the scheme would end up being a "massive subsidy" of Hydro by the province. The OMEA expressed its support for the policies of Hydro's Treasury Division but shared Board Counsel's reservations over Hydro's money market activities.

The NBPUC argued that Ontario Hydro was making the unrealistic assumption that unlimited capital funds will be available for its expansion in a period when in fact the availability and cost of capital are in serious doubt. It asserted also that the massiveness of Hydro's borrowing plans might even jeopardize the province's all-important credit rating. And lastly, it contended that Hydro's financing policy, while incorporating such rule of thumb financial indicators as rate of return and debt/equity ratio, does not deal with such important issues as internal cost efficiency and the basic prudence of investment decisions.

The Sierra Club expressed its concern that the projected growth of Ontario Hydro was so "explosive"

that the capital required to finance it will either increase rates significantly or seriously threaten the borrowing power of both Hydro and the Province. It added that it felt Hydro was not making a sincere effort to limit the expansion of its system and that it was still aggressively growth-oriented. It recommended that as much system expansion as possible be financed internally so that the resulting rates would alert consumers to the massive growth taking place. To increase the debt/equity ratio, it felt, would only defer these costs to later generations.

12.6 Views of the Board

Hydro has presented and defended with great skill the need for a program requiring some \$26 billion of borrowings between 1974 and 1986. It is evident that a program of this magnitude surpasses that of virtually every other enterprise in Canada including both utilities and non-utilities. Its management will require the very best combined skills of Ontario Hydro's Treasury staff and that of officials in the Ministry of Treasury, Economics and Intergovernmental Affairs of the Province of Ontario.

It is evident from our review of the proposed financial policies of Ontario Hydro in Chapter 11, that the new proposals will do very little, if anything, to raise cash flows from internal sources above their historic levels. They really only maintain the status quo. The decline in the debt/equity ratio, even after applying the new proposals, appears to result from the combined effects of inflation, the preponderance of capital-intensive nuclear plant in the system expansion program and the growth in reserve margin requirements. The result is a very significant increase in capital requirements relative to assets in service and therefore to internal cash flow, most of which is provided by depreciation charges. As stated by Board Counsel, it would seem that the new financial proposals do little more than to maintain Hydro's present respectability in the investment community.

It seems very doubtful whether an occasion will arise when a credit such as Hydro or the Province cannot raise money. The question really is only one of terms (long or short) and the price. Although there was not much discussion of the point, it seems

evident to the Board that Hydro should attempt to form some judgment as to the point at which the incremental capital requirements of, for example, an intensive nuclear program may increase the price of money to Hydro. It was established that this has not in the past been a factor in the economic assessment of investment alternatives.

Although it is acknowledged that the effect in 1975 of the Board's recommendation that there be some reduction in the capacity reserve requirements would be minimal, the savings in capital requirements would mount quickly to significant levels in the years following.

As to the competition that Hydro will face from the Province in the capital markets, the Board is inclined to share the concerns of Board Counsel that the combination of a levelling off of CPP moneys and the uncertainty concerning the continued flows of internal funds to the Province will likely lead to some increased competition.

Hydro Counsel submitted that the estimates placed in evidence on this point are speculative and unsupported by evidence tested under cross-examination. They nevertheless accord with information on these matters which is fairly general public knowledge. The Board proposes that the government and Hydro give early consideration to developing a financing plan appropriate to their joint needs which recognizes the possible limitations of funds available in the long-term market.

The Board found the evidence on financial integrity confusing but admits this may be inherent in the subject matter. Two years ago, Task Force Hydro wrote that "In the capital market no essential distinction is made between the credit standing of Ontario Hydro and that of the Ontario Government because the latter guarantees the bonds of the former". McLeod, Young, Weir and Company Limited stated in their submission that "there is little evidence....that lenders may begin to more closely examine the financial ability of Ontario Hydro to service its own debt". Salomon Bros. state that "at the present time, it could be said that most

buyers of Ontario bonds are not vitally concerned with the financial integrity of Hydro". Significant portions of the Hydro submission then go on to examine in considerable detail many facts of financial integrity in the utility industry. In effect, it seems to the Board that much of the discussion is about something that none of the experts evidently showed much concern about. Conversely, all the financial experts seem agreed that somehow Hydro must be conscious of its financial integrity if, faced with enormous capital demands in a competitive market, it does not want to run the risk of impairing its credit standing and that of the Province and therefore facing higher interest rates.

Professor Neufeld, in his report to Task Force Hydro, made a number of recommendations regarding the financing of Ontario Hydro, most notably a strong statement on the need for a firm rate of return objective. He also said that "I believe that my recommendations are important if the forecast of future Hydro and national capital expenditures is

correct. But it is important to understand that if future capital expenditures are larger than forecast, then my recommendations are all that more important". We now know that Dr. Neufeld's forecast of Hydro's new total debt requirements have almost doubled in terms of escalated dollars. It is to provide a firmer basis for the continuing financial viability of Hydro and to ensure its continued capacity to attract capital that the Ontario Energy Board supports the continuation of the provincial guarantee and presents its proposal for a rate of return objective for Hydro.

The Board was impressed with the evidence on the efficiency of the Canadian capital market and the fact that only in Canada can \$100 million be raised for Ontario Hydro at virtually a moment's notice with a narrow underwriting spread. The strength of this market underlines the appropriateness of the financing priorities of Hydro, as explained by its Treasurer, that if he could, he would finance all his requirements in the Canadian long-term market.

The Board must say, however, that it found the evidence on the short-term note market and on the U.S. private placement market somewhat weak. The Board notes that from the present ceiling of \$250 million in the note market, just recently raised to \$500 million, Hydro's financing plan calls for a \$2.3 billion program in that market to 1986. Similarly, the program calls for \$3.9 billion financing in the as yet totally untested U.S. private placement market.

The Board has no real comments on the new liquidity policy beyond what was said in Chapter 11 on liquidity as one of the reasons for establishing a revenue reserve. The Board feels that Hydro Counsel dealt adequately with the concerns raised by Board Counsel and some intervenors on the subjects of Hydro's debt retirement operations, short-term borrowings and short-term investments, use of bank lines of credit, disinvestment of reserves and the financial relationship between Hydro and the provincial and federal governments.

A FINANCIAL PLAN FOR HYDRO

In Chapters 11 and 12 of this report, the major financial and financing policies of Ontario Hydro were reviewed in broad terms and little attempt was made to comment on the specific effect of the policies adopted. In Chapter 9, the current and proposed capital construction program was discussed as was the manner in which the total capital expenditure requirements for 1974-86 were determined.

This Chapter discusses the long-range financial forecasting process in Ontario Hydro and the steps by which the Corporation arrived at the current financial plan for 1974-86. It concludes with a section on the rate of return and its role as a guideline in determining overall financial performance.

13.1 The Financial Forecasting Process

Hydro's Financial Planning Model (FPM) is a computerized simulation model of Hydro's major financial features. It is a further development of the CAPEXP model described in Chapter 9. CAPEXP produces annual data rather than monthly cash flows, and therefore is of an aggregative nature and appropriate for long-range planning purposes. Hydro said that it did not use the model for ~~rate-setting~~ purposes.

A feature of the Financial Planning Model is that it has been kept simple to use, easy to revise and cheap to run. Testimony was given that it costs only about \$3.00 of computer time per run. Equations are solved sequentially rather than simultaneously and the computation does not select an optimum alternative but rather examines each case individually.

Hydro's financial experts explained that the normal procedure was for the engineering branch to provide a long-range scenario of generation development for which the financial team would try to develop appropriate financial policies to finance it, using FPM to simulate those financial policies to provide the cash flow analysis. The model is not sophisticated enough, it was explained, to supplant human judgment but only to augment it and to allow for better informed decision-making.

Hydro tabled nine reports showing the power of the FPM to take an entire program and assess its long-range financial policy implications. For example, it was shown how the model could test the feasibility of overall financial objectives and guidelines to indicate their implications with regard to borrowing requirements and the financing

required. The model also tests alternative objectives in terms of the effect on bulk power costs, and on debt equity ratios and other indicators of financial integrity.

The model is designed to differentiate between classes of assets, for example, nuclear versus fossil fuel stations, and other generation assets. It applies the appropriate depreciation method to each class. It also maintains the desired level of liquidity.

Of particular interest is the rate of return analysis statement, reproduced as Table 7. This summarizes the pertinent cash flows and balances required to assess financial integrity, the return on equity and return on rate base as variously defined, including a definition which Hydro says is its best attempt at a rate of return on a basis comparable to that used by the Ontario Energy Board for the Ontario gas distributors (line 27).

The final statements show the cost of power by major components in total dollar terms and in dollars per kilowatt, so as to present the impact on the customer in unit cost terms, as well as in percentages to show how the relativity of the cost performance changes over time.

NATL OF RETURN ANALYSIS STATEMENT (MILLIONS OF DOLLARS)

	ESTIMATES													
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
NATL BASE														
1. NET PLANT LESS PROVNC CONTRIBTS	4740.	5122.	6142.	7151.	8024.	9324.	10296.	11840.	13561.	15272.	17005.	19432.	21576.	
2. MATERIALS INVENTORY	53.	58.	69.	80.	90.	104.	116.	134.	154.	173.	194.	223.	249.	
3. FUELS INVENTORY	113.	130.	173.	190.	200.	236.	270.	270.	279.	287.	295.	366.	412.	
4. CASH + WORKING CAPITAL	59.	65.	76.	89.	100.	116.	129.	149.	171.	193.	216.	241.	277.	
5. TOTAL NATL BASE	5000.	5404.	6480.	7544.	8465.	9837.	10862.	12492.	14307.	16112.	17941.	20501.	22762.	
EQUITY														
6. GENL RETIREMENT EQUITY	1013.	1088.	1174.	1274.	1385.	1512.	1655.	1818.	2004.	2215.	2451.	2722.	3023.	
7. ACCTDLY SYSTEM EXPANSION EQUITIES	68.	147.	270.	340.	451.	574.	709.	861.	1028.	1210.	1413.	1637.	1887.	
8. BALANCE OF SURPLUS/DEFICIT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
9. RESERVS + PROVNC CONTRIBTS	376.	376.	376.	376.	376.	376.	376.	376.	376.	376.	376.	376.	376.	
10. TOTAL EQUITIES	1457.	1611.	1790.	1990.	2211.	2463.	2740.	3055.	3407.	3801.	4240.	4737.	5286.	
DEBT														
11. LONG TERM DEBT	5082.	5903.	6961.	8141.	9411.	11115.	12738.	14461.	16041.	18161.	20164.	22252.	24492.	
12. NOTES PAYABLE	280.	350.	420.	450.	450.	188.	216.	208.	222.	208.	276.	267.	276.	
13. TOTAL DEBT = 10+11	5362.	6253.	7381.	8591.	9861.	11303.	12954.	14669.	16264.	18369.	20459.	22519.	24768.	
INTEREST														
14. GROSS INTEREST PAYABLE	328.	395.	480.	584.	694.	806.	944.	1061.	1216.	1363.	1536.	1707.	1879.	
15. INTEREST CAPITALIZED	86.	135.	199.	203.	240.	259.	302.	354.	378.	406.	457.	487.	505.	
16. NET INTEREST INCOME	21.	21.	21.	21.	23.	24.	25.	26.	26.	29.	32.	32.	34.	
17. NET INTEREST EXPENSE = 13-14-15	219.	239.	269.	359.	430.	523.	617.	701.	812.	927.	1047.	1186.	1341.	
CASH FLOW ITEMS														
17. DEPRECIATION EXPENSE	154.	169.	198.	238.	275.	319.	366.	420.	487.	557.	631.	720.	814.	
18. DEBT RETIREMENT CHARGE	70.	75.	97.	99.	111.	128.	142.	163.	186.	211.	237.	270.	301.	
19. SYSTEM EXPANSION CHARGE	64.	79.	92.	100.	110.	124.	135.	152.	166.	183.	203.	226.	246.	
20. OTHER INCOME	4.	5.	4.	3.	2.	-4.	-4.	-5.	-5.	-6.	-6.	-7.	-7.	
WATER ANALYSIS														
21. WATER: EQUITY RATIO 12/(12+Y)	78.63	79.51	80.46	81.19	81.68	82.11	82.54	82.77	82.68	82.46	82.83	82.62	82.41	
22. TMS GROSS INT CVRD (13+14+19+20)/13	1.44	1.40	1.36	1.35	1.32	1.31	1.29	1.29	1.29	1.26	1.28	1.29	1.29	
23. TMS GROSS INT CVRD (16+18+19+20)/16	1.66	1.66	1.66	1.66	1.52	1.47	1.44	1.44	1.43	1.42	1.41	1.41	1.40	
24. RETURN ON EQUITY	11.32	11.05	11.24	11.06	10.84	10.75	10.57	10.72	10.71	10.65	10.61	10.70	10.58	
RETURN ON RATE BASE														
25. TIL CPTL CHRG MTRN (16 TO 20)/15	10.30	10.50	10.35	10.60	10.96	11.08	11.57	11.46	11.51	11.62	11.76	11.68	11.87	
26. TIL CSH FLW MTRN (17 TO 20)/15	5.93	6.07	5.88	5.84	5.68	5.76	5.69	5.66	5.63	5.62	5.93	5.89	5.98	
27. REGULATORY MTRN (16+18+19+20)/15	7.23	7.36	7.29	7.45	7.71	7.84	8.19	8.10	8.11	8.16	8.25	8.17	8.27	
28. NET RETURN (18+19+20)/15	2.86	2.94	2.62	2.69	2.63	2.52	2.51	2.48	2.43	2.41	2.41	2.39	2.38	

Source: Volume Three, Financial Policies and Objectives
Supplement 5.1-1 p.5

13.2 Selecting the Optimal Financial Plan

Hydro explained that the financial planning embraces three major concerns: the maintenance of financial integrity, the short- and long-term availability of capital; and the impact on bulk power costs. In essence, Hydro said the decision could be reduced to a determination of the portion of the financing requirements which should be raised internally through rates, and the portion to be raised externally through debt. Hydro said that as no precise formula can be established to do this, a plan had to be prepared in which historical performance, forecasts of costs and financial needs were all considered. Flexibility will always be required, Hydro said, to enable it to cope with the realities of changing conditions.

Hydro said that as far back as 1970 the need for additional internal financing was recognized and, at the time, it was recommended that debt/equity ratio and return on net assets be introduced as major guidelines in setting financial policies. In April 1973, Task Force Hydro tabled its fourth report containing recommendation 4.3 -- "Hydro take the initiative with Government in undertaking a periodic review of Hydro's financial performance, using rate of return on net assets as a principal criterion." About this time, Hydro prepared a specific financial plan for the period 1973-1977, a major purpose of which was

to support the proposed generation program submitted in June 1973 to the Provincial Government. In line with another Task Force Hydro recommendation, the plan maintained the current debt/equity ratio at 78/22, reduced borrowing requirements and stayed within what the then Commission felt was an acceptable increase in bulk power costs.

Subsequent to the development of that plan, both the costs and the size of the generation development program increased to the extent that the plan no longer met Hydro's main objective of stabilizing the debt/equity ratio. After a review, three alternative financial plans were developed, submitted to the Ontario Hydro Board and also tabled as part of Hydro's submission on financial policies and objectives. The alternative plans were as follows:

1. Alternative A was based on maintaining that debt/equity ratio of 78/22 throughout the forecast period, 1974-1986.
2. Alternative B was based on continuing the rate of debt retirement and system expansion charge as provided for in the 1973 financial plan. This resulted in a 10.5 per cent return on equity which is maintained throughout the forecast period.

3. Alternative C was based on maintaining a debt/equity ratio of 80/20 up to 1986. This plan was selected as a compromise between alternatives A and B.

Part way through the hearing, Hydro tabled an Advice of Board Decision dated March 25, 1974, in which the Hydro Board accepted Alternative B as a basis for establishing 1975 rates. The Advice explained that the major consideration was Alternative B's less severe influence on bulk power costs. Hydro explained that although Alternative A met best the criteria of reducing borrowings and maintaining financial integrity, the increased costs of the system generation program, resulting mainly from the \$500 million cost of Bruce heavy water units C and D and the new and higher 1973 escalation forecast, made the attempt to maintain the 78/22 debt/equity ratio unacceptable in terms of the increase in bulk power costs. Significantly, in its Reasons the Hydro Board stressed "the importance of achieving economies through increased operating efficiency and improved productivity in order to attain better financial results than those forecast in the report as flowing from this alternative." (Exhibit 293).

Hydro said that while tests and techniques are available to assist in determining what constitutes a reasonable

financial strategy, no single test is conclusive, nor is any group of them definitive. Table 8 illustrates a number of factors which Hydro considers important indicators of financial performance and integrity, including debt/equity ratio, rate of return on assets and equity, times interest covered, various cash flow ratios and changes in bulk power costs. The values in the table for the years 1974-1978 were computed through the use of detailed short-range financial forecasting processes, whereas the 1979 and later figures were generated by the Financial Planning Model. These data are consistent with the long-range forecast of capital expenditures shown in Table 1 of Chapter 7.

Replying to a criticism of Board Counsel that the three plans offered no genuine alternatives, Hydro replied that the percentage increases in smoothed revenue requirements for 1975 vary from 15.3% for Alternative B to 19.9% for Alternative A; that 1986 debt/equity ratios range from 78/22 for Alternative A to 84/16 for Alternative B; and that the 1986 return on rate base varies from 8.2 for Alternative B to 8.6 for Alternative A.

13.3 Rate of Return

Hydro stressed that its 1973-1977 financial plan, as well as the Alternatives A, B and C, were merely pragmatic

TABLE 8

ONTARIO HYDRO

Financial Projection Simulating a Policy Objective of a 10.5% Return on Equity

<u>FINANCIAL STATISTICS</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
1. Total Capital Expendtrs \$-Mill	890	1112	1368	1805	1891	2072	2276	2538	2716	3043	3464	3771	8987
2. Total Annual Brwngs \$-Mill	770	1000	1350	1700	1750	1700	1979	2154	2172	2586	2981	3060	8024
3. Debt / (Debt + Equity)	78.3	79.1	80.2	81.9	82.5	82.5	83.1	83.4	83.6	83.7	84.0	84.0	84.0
4. Debt Rtrmnt + System Xpn \$-Mill	133	152	171	191	214	240	275	313	351	389	437	496	546
5. Return on Rate Base Equity %	9.3	11.1	9.7	7.7	10.9	13.6	10.6	10.7	10.7	10.6	10.6	10.7	10.6
6. Return on the Rate Base %	7.5	8.1	7.4	7.5	8.2	8.8	7.3	7.5	7.5	7.7	7.9	7.9	8.2
7. Times Interest Covered	1.3	1.4	1.3	1.2	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2
8. Bulk Power Cost \$-Mill	800	1015	1269	1573	1835	2160	2335	2646	2986	3354	3787	4344	4897
9. Bulk Power Cost \$/kW	65.69	77.49	90.53	105.17	115.25	127.24	128.92	136.68	144.26	151.77	160.42	172.30	181.87
10. Blk Pwr Cst \$/kW Annl Incrs %	1.4	18.0	16.8	16.2	9.6	10.4	1.3	6.0	5.5	5.2	5.7	7.4	5.6

Source: Exhibit 331, Table 2.

solutions to the problem of balancing financial integrity, capital availability and bulk power costs. The establishment of an appropriate level of internally-generated funds has been based on these considerations, Hydro said, and the level of funds has been expressed in various ways to see the effect on a number of indicators of financial performance and integrity. In the course of the hearing, attention was focused by the representatives of the underwriting groups on the debt/equity ratio, but much of the attention of Board Counsel and the intervenors was devoted to the rate of return.

On this latter subject Hydro made the following points:

1. The merit of using rate of return on assets as a major financial philosophy was seriously considered by Hydro but has not been adopted for this purpose; nor has Hydro discussed with Government the question of determining an appropriate rate of return objective for Hydro as proposed by Task Force Hydro.
2. Ontario Hydro uses rate of return on equity as a mechanism (sometimes referred to as an "indicator") assessing financial performance. It is not used as a target.
3. Reacting to a comment by Mr. Macaulay that Hydro seems to vacillate between use of rate of return on

net assets and the rate of return on equity, Hydro said that the two can be related. Hydro said that it has also used rate of return on equity as a mechanism for calculating the appropriation for debt retirement and system expansion, the results of which are shown on Table 8.

In presenting the alternative financial plans, Hydro said that it was clear that the forecast level of the rate of return under any of the three alternatives would be considerably higher than the return earned in the period 1967-1972. This is shown for Alternative B, the one selected, on Table 9.

13.4 Views of the Intervenors

Although the OMEA has argued that the "rate of return" concept can be applied "only in an artificial way" to the financial performance of Ontario Hydro, a public body mandated to supply power at cost, it nevertheless made use of the concept "return on equity" to illustrate the magnitude and impact of its own proposal relating to Hydro's Financial Plan. The OMEA proposal, as outlined in its submission, is that Hydro levy as an explicit charge in the cost of power a capital contribution at a rate which would increase annually until the amount of such gross capital recovery is 15% of equity in any one year

TABLE 9

ALTERNATIVE B

ONTARIO HYDRO

Financial Statistics

(Forecast Based on 10.5% Return on Equity)
1950 - 1973 Actual 1974 - 1985 Projected

(1)	(2)	(3)	(4)	(5)
Year	Debt Ratio	Return on Assets	Return on Equity	Times Interest Covered
1950	67.8	5.1	12.5	2.18
1951	69.6	5.4	12.7	2.20
1952	72.9 (71.9)	4.4 (4.9)	9.2 (11.3)	1.74 (1.92)
1953	74.3	5.0	10.4	1.74
1954	74.9	4.6	11.6	1.73
1955	73.8	5.0	12.8	1.78
1956	74.5	5.4	13.2	1.81
1957	74.9 (74.6)	5.5 (5.1)	12.7 (11.6)	1.78 (1.71)
1958	74.8	4.9	10.9	1.66
1959	74.8	4.8	8.6	1.54
1960	74.2	5.2	9.9	1.59
1961	73.9	4.8	7.6	1.48
1962	73.3 (73.3)	4.5 (4.7)	5.0 (6.4)	1.35 (1.42)
1963	72.8	4.3	4.3	1.32
1964	72.3	4.6	5.1	1.36
1965	72.2	4.9	6.9	1.48
1966	72.1	5.4	8.5	1.55
1967	72.3 (72.5)	5.3 (5.4)	6.8 (7.7)	1.47 (1.49)
1968	72.8	5.5	6.9	1.44
1969	73.1	6.1	9.3	1.51
1970	74.2	5.9	6.7	1.35
1971	75.2	5.4	4.7	1.25
1972	76.2 (76.3)	5.5 (6.2)	3.9 (6.6)	1.20 (1.30)
1973	77.7	6.5	8.3	1.34
1974	78.3	7.5	9.3	1.34
1975	79.1	8.1	11.1	1.39
1976	80.2	7.4	9.7	1.32
1977	81.9 (81.2)	7.5 (8.0)	7.7 (10.6)	1.23 (1.32)
1978	82.5	8.2	10.9	1.30
1979	82.5	8.8	13.6	1.36
1980	83.1	7.3	10.6	1.27
1981	83.4	7.5	10.7	1.26
1982	83.6 (83.6)	7.5 (7.6)	10.7 (10.6)	1.26 (1.26)
1983	83.7	7.7	10.6	1.25
1984	84.0	7.9	10.6	1.25
1985	84.0	7.9	10.7	1.25
1986	84.0	8.2	10.6	1.24

or until the ratio of debt to equity is less than 75/25, whichever limiting condition was reached first. Thereafter the amount of the gross capital recovery and therefore of the capital contribution would be that amount required to maintain the debt/equity ratio equal or greater than 70/30 but less than 75/25.

The OMEA claimed several benefits would accrue from the adoption of this proposal:

1. It would make a major contribution to Hydro's financial integrity. According to the OMEA, this view was supported by Hydro's external investment managers.
2. It would have an anti-inflationary impact by minimizing Hydro's need to borrow money at high rates of interest.
3. It would place pressure on industrial and commercial customers to use their own sources of capital rather than relying on those of Hydro.
4. The legitimate increase in the cost of electrical energy that it would involve now would probably contribute to a dampening of demand and less energy wastage in the long run.
5. It would improve the allocation of capital cost as between present and future customers.

After contending that its readiness to make this proposal illustrated the preparedness of this group of wholesale customers to accept the disciplinary action necessary to ensure the continued financial integrity of Hydro, the OMEA subsequently made it clear that it found it "most disturbing" that Hydro, in its submission, did not even mention the OMEA capital contribution or list it as one of the alternatives. This omission, the OMEA submitted, was "the most outrageous" of "several indications" of Ontario Hydro's determination to reduce, if not destroy, its financial accountability to the municipal utilities.

The NBPUC limited its remarks on Hydro's Financial Plan to the general ones that the proposed system expansion plans were excessive and grandiose (a view shared by the Sierra Club), that they were premised on over-optimistic assumptions regarding the availability and cost of capital and that they excluded internal cost efficiency considerations in favour of reliance upon such "rule of thumb" financial indicators as debt/equity ratios and rate of return.

13.5 Views of the Board

The Government and Hydro have had before them for some time the opinions of Task Force Hydro on the matters discussed in this chapter, but those opinions have by no means been wholly transformed into formal policy and practice

by the Government or Hydro and the Board feels free to express its own views in the light of the evidence and argument put before it.

The Board accepts that the major factors which need to be considered in setting financial policy are, as Hydro says: the availability of capital; financial integrity, including the tests of debt/equity ratio, interest coverage, debt/fixed asset ratio, and rate of return; and the impact on the price of power. The influence of these three factors on Hydro's financial policies may vary from time to time. In theory, the first and second should never have an impact as long as there is a provincial guarantee to remove the element of risk in the minds of investors, but McLeod, Young and Weir's and Salomon Brothers' witnesses indicated that the provincial credit standing may be such that continued borrowing of large amounts by Hydro could affect the market's assessment of the value of this guarantee and possibly raise the cost of borrowing and availability of money to both Hydro and the Province.

Neither of these firms was very specific as to the criteria by which the market might judge the value of the guarantee, although it was suggested that when Hydro's debt ratio

exceeds 90%, investors would begin to look through the guarantee to the financial viability of Hydro itself. One thing that was apparent to the Board, however, was that the optimism of the financial experts as to the availability of funds cannot be shared without some reservations. This is discussed in greater detail in Chapter 12. As long as the substantial reliance must be placed on foreign markets, including reliance on a totally untested U.S. private placement market, as is the case with Hydro, some concern must remain. It is mainly for this reason that the Board thinks it highly desirable that Hydro establish financial policies designed to give assurance to investors that the provincial guarantee will never be called upon. It may be difficult enough to obtain the funds even if investors have this assurance.

Task Force Hydro recommended that "Hydro take whatever steps are necessary to prevent any further increase in its debt/equity ratio". After an initial step in this direction in setting rates for 1974, Hydro abandoned the principle in setting rates for 1975 because of the very large rate increases that would result. On reviewing the evidence presented in the hearing, the Board thinks Hydro was right. The evidence we have from the financial community is that although investors in Hydro bonds will increasingly have regard to the financial integrity of

Hydro as it might affect the provincial credit, the provincial guarantee of Hydro's bonds puts them in a different position from investors in a privately-owned public utility corporation. A reasonable conclusion is that, provided financial integrity is maintained in other ways, Hydro does not need to, and should not, adopt a policy of maintaining its debt/equity ratio at any particular level.

Having abandoned maintenance of a debt/equity ratio, Hydro was left without a standard for measuring the amount of increase in internally-generated funds that it considers necessary.

What standard or standards are then left for measuring an appropriate amount of increased internally-generated funds? Task Force Hydro felt that such an increase was necessary and left open the defining of appropriate policies although it was clear that it felt that the rate of return on net assets would be a principal criterion. In any event, after first toying with rate of return on net assets, Hydro abandoned it and tentatively adopted a rate of return on equity of 10 1/2%. Hydro had no great confidence in the particular rate of 10 1/2% and made very clear its unwillingness to accept rate of return as a policy constraint even on a short-term planning basis. Equally clear is the

reluctance of the Hydro Board to accept the consequences of adoption of well-defined policies to assure financial integrity, if the consequences include very sharp rate increases. Nowhere in evidence was the relative importance of financial integrity and increasing power costs delineated; some rough calculations by the Board suggest that the financial policy changes proposed for the purpose of better providing for financial integrity would add about 5% to 7% to the cost of power on a once-only basis.

The financial plan as presented to the Board appears to be very much as Board Counsel described it, that is, that Hydro decided it needed a certain amount of money in 1975 and then set about justifying it. This is very practical and pragmatic, but it does not seem adequate for a public enterprise of the importance of Hydro unless the justification is in the form of continuing policies.

It became clear in the hearing that there is no more justification for the use of 10 1/2% than say, 8 1/2% or 12 1/2% return on equity. The figure resulted simply from the adoption of a particular debt/equity ratio in setting the rates for 1974. It is not surprising that Hydro was careful to describe the 10 1/2% return on equity as a

"mechanism" used in developing 1975 rates rather than a "policy" applicable on a continuing basis.

The Board thinks that, for the reasons given by Task Force Hydro, an increase in Hydro's internally-generated funds is appropriate. It also thinks that the determination of the standard is a matter of judgment. The matter is too important to Hydro's customers to leave to unguided judgment from year to year. A policy or direction that is simple and gives a rough approximation to theoretical requirements is better than no policy. Hydro's refusal to adopt a 10 1/2% return for at least a three-year period is inconsistent with its proposed three-year rate smoothing.

The Board thinks that what the evidence in Phase II really demonstrates is that, having regard to the size of Hydro's future financing program, Hydro should move in the direction of further financial self-sufficiency in order to protect the provincial credit that it relies on. Such a move is also strongly indicated by considerations of the economic allocation of resources, as brought out by Task Force Hydro in its fourth report. It is possible to over-emphasize the importance of moderating the proposed financial policies in order to avoid public criticism of required rate increases. Underpricing of electrical energy can only lead to an excessive demand for it and, therefore,

an increase in the already enormous capital requirements of the Corporation. Therefore, the adoption of a policy that heads Hydro in the direction of earning a competitive rate of return is soundly based in economics and public policy.

Hydro has always had a return on equity in the form of a debt retirement charge and it has put Hydro in a sound financial position today. The considerations mentioned above indicate the need for a move to a higher return in order to do the job in the future that the debt retirement charge has done up to now.

One of the merits of the debt retirement charge was that it was not discretionary. The new return on equity should flow from a formula that is as simple and understandable as possible, is expected to continue and is enshrined at least in a formal policy decision of the Hydro Board. It is also desirable that it move upward if the cost of debt moves upward and makes outside financing more expensive.

The Board believes that a rate of return target is eminently suited to the needs of Hydro at this point in time and is somewhat surprised at the apparent reluctance of Hydro to accept it as a target or as a constraint. The

OMEA expressed its opposition to rate of return on the grounds that it invites unwarranted comparisons between Ontario Hydro and investor-owned corporations. Having had it clearly established, however, that Hydro is very much in competition with these enterprises for capital funds, the Board does not find the OMEA argument convincing. The Board suspects that the OMEA's real concern is with the concept of rate of return as being profit-related; but it is unrealistic to refuse to recognize that Hydro has always made a profit and that it is financially sound today because it has done so.

Ontario Hydro uses a rate of return in the form of a discount rate as an indispensable yardstick for the evaluation and comparison of investment alternatives. The use of a rate of return, determined in a simple and understandable way and on a continuing basis, as a means of ensuring adequate revenues to protect the financial integrity of Hydro, seems equally appropriate. The selection of a rate, or a formula for determining the rate, must involve judgment but is not without rational foundation.

Since Hydro borrows most of its capital requirements, the cost of that portion of its capital can be reasonably evaluated as the embedded cost of the interest on the

debt. Nor is there any real disagreement that the remainder of the capital provided by way of customer contributions through "retained earnings" has some value to the customers. Since it will never be possible to determine exactly what this value is, using the same rate as that for debt is probably the best estimate that can be made. If it were not for some practical considerations, the Board would suggest that the cost of debt be used as the rate of return on the equity, with greater weight being given to current cost of debt.

Unfortunately, the practical difficulties are very great. With the three-year smoothing process, Hydro must forecast its costs three years in advance and the evidence clearly demonstrates the weakness of even one-year forecasts of current costs of money. Therefore, upon the assumption that the cost of money will continue for some years to come at a high level and thus cause Hydro's presently low embedded cost of debt to increase year by year, the Board suggests that an appropriate rate of return on the equity for Hydro to adopt until there is a major change in circumstances is the estimated embedded cost of long-term debt as at the end of the year for which revenue requirements are being determined, expressed as a percentage plus two percentage points. The result would

be, on the assumptions mentioned, a rate of return for 1975 of between 9% and 10% (i.e., the average cost of long-term debt over a fairly short recent period of years) and a rate that would increase each year to and beyond 10 1/2% if the cost of money remains at a high level. In the opinion of the Board, the formula would provide Hydro with a workable tool for forecasting costs several years ahead, would give recognition to current costs of money without introducing wild uncertainties in forecasts, and, on the basis of the evidence available at this time, would provide sufficient revenue to meet the purpose of assuring the financial integrity of Hydro. The Board would not wish, however, for the rate of return formula to be considered as an immutable constraint on Hydro's financial policies. The Board of Directors of The Ontario Hydro Corporation must be free to amend the policies of Hydro to meet any substantially changed circumstances.

PART 3

OBSERVATIONS AND OPINION

OBSERVATIONS ON
THE SCOPE AND CONDUCT OF THE HEARING

As the hearing was the first hearing by the Ontario Energy Board into matters concerning Ontario Hydro, the Board considers that it should make some general comment as to its effectiveness and the appropriateness of the procedures followed.

In addition, as the hearing represents the first occasion on which Ontario Hydro has had to submit its over-all program and policies for extensive review at a public hearing, some comment regarding the quality of Hydro's presentation is also appropriate.

One of the problems facing the Board was the limitation of time. No time limit is prescribed by section 37a of The Ontario Energy Board Act for the kind of reference that is the basis for this report and none was prescribed by the Minister. However, one of the main purposes to be served by the inquiry into expansion of the power system and into the financial policies of Ontario Hydro was to lay the ground work for the initial inquiry into the rates

of Hydro. It was confidently and accurately predicted that that matter would come before the Board about the first day of May, 1974, and that there would then be a period of only four months within which to serve and publish notice of a hearing, hold the hearing and make a report. The Board planned to complete the hearing on the initial reference before receiving the second reference, i.e., the reference on 1975 rates, and to make its report no later than the commencement of the hearing on the second reference. The Board was unable to meet these deadlines but considered that its report had to be made no later than the report on 1975 rates, i.e., the end of August, 1974.

The delay had some advantages, because of the close relationship of the evidence on financial policies, which was received at the hearing on the initial reference, with the evidence as to the application of the policies in determining rates for 1975. However, since the hearing on 1975 rates did not end until August 14, the Board found itself in the position of having to prepare two major reports in a period of a little over two weeks. Consequently, they are somewhat less polished than the Board would like them to be.

Another problem was how to respond to the submissions of Ontario Hydro regarding its power system expansion plans and its financial policies. An adequate understanding requires technical advice of a high order. Such assistance is not easy to obtain and, when obtained, is expensive. It is not readily available to individuals and voluntary organizations who wish to participate in the proceedings as representing the public interest or some aspect of it. Accordingly, the Board retained a small group of well-qualified experts to assist it and Board Counsel in carrying out the thorough inquiry that the importance of the matter called for. At the same time, the Board recognized that various individuals and groups would be interested in certain aspects and would wish to be heard. The procedures had to be designed initially on the assumption that there might be very many such individuals and groups.

Another problem was the location and times for the hearing. The Board considers that it should hold its hearings outside Toronto when practical and necessary to deal with local issues. In the present case this did not seem appropriate. One of the persons who presented his views to the Board, Mr. Kalevar, thought that evening sittings should be held so that the public could more conveniently attend, after normal working hours. This would mean changing

the normal working hours of a fairly large group of witnesses, advisers and others who participated actively in the proceedings. Even so, it would undoubtedly be appropriate for some kinds of hearing. The Board considered, however, that the thorough analysis of technical issues that constituted most of this particular hearing was not likely to attract the public in much greater number in the evening than during the day. For Mr. Kalevar's convenience, an evening sitting was held to receive his views.

Finally, the Board became conscious, as the hearing on power system expansion progressed, of the need for a look farther into the future in order to better assess the merits of the 1977-82 Generation Development Program. Also, environmentalists who appeared before the Board were concerned that the terms of reference limited inquiry into matters of particular concern to them.

In this connection, the Board is pleased to note that in a statement released on July 11, 1974, the Minister of Energy announced that Ontario Hydro's long-range program, for the period 1983-93, will be submitted to public hearings for review from the standpoint of regional planning, socio-economic and environmental factors as well as technical and

operational implications. He indicated that these hearings should commence later this year or early in 1975 before a hearing body yet to be named.

The Board made a special effort to bring the hearings to the attention of the public and to facilitate an understanding of the issues by the public and the press. It must be said that the response was a little disappointing. The explanation probably lies in the complexity and technical nature of the issues and the length of time required to deal with them. The hearings undoubtedly provided one of the most detailed and exhaustive reviews of a public utility program heretofore attempted in Canada. The published record should provide an excellent reference for Hydro and those interested in its future operations. Hydro has indicated that the record will be made available in its library to the general public, and the Board considers that this will greatly add to the public knowledge of the workings of Ontario Hydro and should assist in facilitating better public participation in Hydro's future programs. Board files on the case are, of course, equally available for public inspection. They include useful working papers prepared by the Board's staff and consultants.

The procedures adopted by the Board required the pre-filing of evidence by Ontario Hydro and by other persons

wishing to present evidence. The Board heard submissions of evidence and argument by persons other than Ontario Hydro on the basis that they would carry weight according to the manner in which they were submitted and subjected to testing. The Board restricted the right of cross-examination to Counsel for Hydro and Board Counsel as a general rule, but permitted others to apply for the right to cross-examine, provided they could demonstrate good and sufficient reason for so doing. In the opinion of the Board, the procedures followed provided for a public hearing that was orderly and effective and, at the same time, made fair and reasonable provision for public participation. If further experience indicates the need for changes, they will be adopted for use in future hearings.

There was some complaint regarding the inability of the public to participate because of hearings being held during normal working hours, and effective participation being relatively costly. The Board recognizes that it is a difficult task for any citizen group to challenge Hydro on any issue. The testimony indicates that Hydro has been hesitant to make its internal records easily accessible to the public and the Board is of the opinion that effective public participation in Hydro affairs requires that Hydro establish a mechanism whereby all but truly confidential records be open to reasonable public inspection.

The difficulty and expense attendant upon effective participation in a long hearing into technical issues indicate that the Board should not leave it to interested individuals and public interest voluntary organizations to bring out all the important relevant facts but should through Board Counsel and technical advisors actively work towards this end.

During the hearing, the role of Board Counsel proved to be extremely demanding. In addition to having the responsibility, on behalf of the Board, of cross-examining a number of Hydro witnesses on every significant aspect of Hydro's extremely detailed and highly technical submission, he was required to cross-examine the other witnesses and to assist interested persons, not represented by counsel, in eliciting information from Hydro witnesses and other witnesses which they thought pertinent and helpful. The Board records its appreciation for the work of Mr. R. W. Macaulay, Q.C., as Board Counsel. His competence, dedication and meticulous preparation were demonstrated throughout the hearing and greatly assisted the Board in carrying out its responsibilities. Mention should also be made of the able assistance given to the Board and Board Counsel by an advisory group composed of Board staff and outside consultants.

In respect of the presentation of Ontario Hydro, the evidence had been carefully prepared and was presented at the hearing by knowledgeable and competent witnesses. The Board observed, however, that few senior executives of Hydro presented evidence at the hearing. The Board recognizes that during the course of the hearing Ontario Hydro was in the throes of reorganization at the top level but questions whether, in future, it will be desirable for Hydro to leave so large a share of responsibility to the middle-management level in presenting significant Hydro policy before a public hearing.

The evidence provided by Hydro leaves an impression that matters of important policy are created well down in the Hydro organization. The internal correspondence of the Corporation which was filed indicated that direct lines of communication existed between the then Commission and members of the staff who were relatively far down in the scale of organization. This, coupled with the failure of senior members of the Hydro staff to appear before the Board, leaves an impression that some vital policy matters may receive an inordinate amount of "rubber stamping" rather than significant executive input during their path to the Hydro's Board of Directors. Also, some of the evidence presented discloses

instances of poor communication within and, particularly, across the various branches of the Hydro organization.

It is only fair to note that Hydro is a large and complex organization in transition and it is facing the matter of implementing some of the far-reaching changes recommended by Task Force Hydro. Some of the deficiencies noted by the Board in this report are undoubtedly receiving the attention of the new Board of Directors of Hydro.

As stated earlier, the Board considers that, on a reference of this kind, it has a duty to undertake a comprehensive and thorough inquiry and to retain such expert advisors and other assistance as may be necessary. It has been the practice of the Board, in proceedings involving privately-owned public utilities (i.e., the gas companies) to charge its own costs to the public utility involved, the end result being that these costs are borne by the customers rather than the tax-payers. In our view, this practice should be followed in the case of Ontario Hydro and it is our intention to make an appropriate order to this end.

It is not the normal practice of the Board to award costs to or against the public utility, as between it and others

participating in the hearing, and we do not think it proper to change this practice in the case of Ontario Hydro. Financial assistance to public interest groups exercising their rights in the public participation process appears to the Board to be a matter of broad public policy.

THE OPINION OF THE BOARD

The Board has, throughout this report, made comments, observations and suggestions. The more important of these are now consolidated and set forth as the formal opinion of the Board required by subsection (9) of section 37a of The Ontario Energy Board Act. The opinion of the Board is as follows:

1. The expansion of the Ontario Hydro power system will be attended by problems of a technical, environmental and financial nature that are only beginning to be fully appreciated by the public. The era of low-cost hydro-electric power generation in Ontario is over and growth in generating capacity must be in the form of fossil-fired and nuclear plants, which are relatively expensive to build and operate. Both these kinds of plant create environmental problems and do not possess the inherent reliability of Hydro electric generating plants. Consequently, an attendant large reserve of generation capacity in the system is required in order to maintain quality of service at traditional levels. The bulk power transmission

system must grow with the generating system and its growth will also be expensive and create environmental problems.

2. The absence of low-cost hydro-electric generating sites to develop for future use, coupled with the effect of inflation, means that doubling of the demand for electricity will require approximately a quadrupling of capital investment. The capital required for Hydro's expansion up to 1982 is estimated at approximately \$16.7 billion.
3. The high capital cost of the kinds of plant and other facilities required for Hydro's system expansion will create unprecedented demands for capital funds. Since its capital funds are obtained either directly or indirectly on the credit of the Province, due consideration must be given to the possible effect of Hydro's borrowings on the ability of the Province to obtain, on reasonable terms, the funds it requires for other purposes. The high capital costs of new plant, coupled with increased operating costs will also probably result in double-digit annual increases in the cost of electricity.

4. Few voices can be heard to say that it was not in the public interest to use the provincial credit to develop the hydro-electric resources of the Province. However, it does not follow that the Province should subsidize expansion of Ontario Hydro's power system in the form of fossil-fired and nuclear generating stations and the necessary transmission lines and transformer stations. Even if Hydro's customers continue to receive the benefits of already-developed cheap hydro-electric power, they must be prepared to bear the cost of future expansion to the extent necessary to prevent impairment of the credit of the Province.
5. In the light of the increasing costs of electricity, Hydro must become more cost-conscious than it has had to be in the past. In particular, the matter of inter-utility productivity comparisons, the amount of reserve capacity needed and the quality of service that will be accepted by customers must be reviewed by Hydro.

6. Pending the recommended review by Hydro of required generation reserve capacity Hydro should immediately, for planning purposes, reduce by five percentage points its estimates of reserve capacity requirements.
7. Export sales of secondary energy, especially nuclear-generated energy, as a means of reducing costs to Ontario customers, should be the subject of a thorough and continuing review by Hydro.
8. Hydro should take the initiative in promoting reasonable measures for the dampening of demand for electricity. Since the users of electricity are, for the most part, customers of the municipal retail systems, success of the promotional effort requires the support of the municipalities. Studies should be made of the likely impact of proposed price increases on the demand for power by Hydro's several classes of customers.
9. The opinion of the Board, with respect to the more important particular matters not mentioned above, that it has considered in that part of the reference that deals with power system expansion is as follows:
 - (a) Hydro's methods of forecasting loads are sound and produce results that have been properly

relied on for planning power system expansion. However, their importance indicates a need for up-grading of the organizational unit responsible for the preparation of the load forecast, the development of closer ties with other econometric forecasting models, a broader socio-economic input and more direct involvement by the Hydro Board. The load forecasting unit should also have a more direct involvement in the rate-making process than in the past.

- (b) The planning of power system expansion is in the hands of competent staff using reasonable methods. However, in the light of the problems that lie ahead, use of better methods of economic analysis is indicated and Hydro's economic manual, which is badly out of date, should be updated. The amount of reserve generating capacity required needs careful re-examination by Hydro in the light of its costs, the value of interconnections, the ability of Hydro to improve performance of units and the acceptable level of reliability of service.

- (c) Hydro should intensify its efforts to ensure a secure supply of the various kinds of fuels required for its use.
- (d) Hydro's estimates of heavy water requirements appear to be excessive and require a thorough re-examination, including an independent review by an agency external to Hydro.
- (e) With respect to the Generation Development Program, 1977-1982, as it affects Hydro's West System, this is, in some respects, in a very early stage, and, in some respects, uncertain, because of the status of contractual arrangements with Manitoba Hydro and possible new loads. Except for these observations, the Board has no comment to make.
- (f) With respect to the Generation Development Program, 1977-1982, as it affects Hydro's East System, Hydro has demonstrated the need to proceed with the Pickering expansion and Wesleyville generating projects and Heavy Water Plants B and C at Bruce and the Board so reported in its interim report dated May 21, 1974. The Board sees no reason why specific

approval should not be given by the Government to the proposed expansion of the Bruce generating station (i.e. Bruce "B") when the Minister of Energy is satisfied as to in-service dates, which may be deferred in accordance with the recommendations in this report.

- (g) The need for Heavy Water Plant D should be thoroughly re-examined by Hydro in light of the recommended review of heavy water requirements and possible changes in the Generation Development Program.
- (h) The latter stage of the Generation Development Program, 1977-1982 (Bowmanville G.S.), and the initial stage of the future program (a fossil station) should be thoroughly reviewed by Hydro to ensure that the best choice is made in the order of installing nuclear and fossil-fired plants.
- (i) Hydro's power system expansion program, over a much longer period than was presented to the Board, should be subject to further review at a public hearing. The Board notes the plan

for this, as announced by the Minister of Energy on July 11, 1974, contemplates review of environmental issues as well as other aspects of the program. The Board recommends that ample time be allowed to whatever tribunal conducts the hearing, but notes that, because of the long lead times necessary for the construction of generating stations and the consequent need for early commitments, it may be found necessary to give priority to the early part of the program.

10. The financial policies of Hydro should continue to be aimed at fairly assigning costs as between present and future customers but must be established on a basis that ensures that they give adequate weight to the need for protection of the provincial credit and to the economic consequences of the possible under-pricing of electricity. Depreciation must be reviewed to ensure that the annual provisions made by Hydro for it are adequate. Capitalization of interest during construction must not be excessive, for example, as a result of delaying the dates when the facilities are deemed to be brought into service. The growth of the

equity must be adequately provided for by policies that will assure investors of the maintenance of the credit of the Province notwithstanding the huge demands for capital for Ontario Hydro for power system expansion. Although certain important portions of the Province receive electrical service from other utilities, the Board assumes that the provincial credit will continue to be used for the development of Hydro. A rate of return on the equity at least equal to and preferably somewhat greater than the cost of long-term debt is indicated.

11. The opinion of the Board, with respect to the more important particular matters, not mentioned above, that it has considered in that part of the reference that deals with financial policies and financing is as follows:

- (a) The financial objectives, as stated by Hydro, must be treated as generalities subject to interpretation. The stated objectives are:

1. To finance needed facilities at the lowest feasible cost consistent with a financially sound operation.

2. To allocate the cost of capital facilities equitably among present and future customers.
3. To be financially independent, remaining at arm's length from government in financial matters, excepting the Provincial guarantee of Hydro's bond issues.
4. To maintain a level of liquidity sufficient to achieve the above objectives.

The term "lowest feasible cost", which appears in the statement of the first objective, originated in a Task Force Hydro report, where it was intended to include environmental, social and financial charges not always properly reflected in earlier notions of power at "lowest possible cost". It seems clear from Ontario Hydro's interpretation that the term is not intended by Hydro to include environmental and social costs that do not require expenditures by Hydro. The third financial objective, financial independence, would be better stated in the language used

by Task Force Hydro, namely, "to strive to remain at arm's length from Government in matters of financial policy to the degree that this is possible having regard for such matters as the Provincial guarantee of its debt and the necessity to comply with the Provincial fiscal policy".

- (b) Hydro is not alone in having to cope with the problems of inflation. But because of lead times required for construction of generating stations and other facilities, it must estimate capital costs as much as seven years in advance. Also it must, because of its methods of establishing rates, estimate operating costs nearly two years in advance and, if revenue smoothing is utilized, nearly five years in advance. Hydro is therefore unusually dependent on the accuracy of its cost escalation estimates. The Chief Economist, who is responsible for these forecasts, should play a larger role in the Hydro organization, including the areas of system planning and rate-making.

- (c) Hydro's depreciation policy and rates should be the subject of an early thorough review and thereafter be the subject of a systematic periodic review. Special attention should be given in the initial review to the adequacy of asset lives and allowance for salvage in the case of nuclear generating plants and heavy water plants. The amounts recorded in the depreciation accounts as unallocated depreciation should be allocated to particular assets and groups of assets.
- (d) Hydro is in need of an adequate financial return and, in the view of the Board, more harm than good is done by attempting to disguise this need by using unusual concepts and names, such as system expansion charge or capital recovery charge, to describe it in part. The Board suggests that the need be provided for by a return on the year-end equity in Hydro calculated according to a rate two percentage points more than the average or embedded cost of long-term debt. The criteria should be settled no less firmly than by a formal policy decision of the Hydro Board

but should be subject to review if there is a substantial change in circumstances, e.g., a sudden and substantial drop in the cost of money or an unexpectedly large increase in demand for electricity attributable to its underpricing in relation to other forms of energy. The need for amending legislation was not examined in any detail at the hearing; if it is needed, Hydro should ask for it.

- (e) Hydro has not given a satisfactory explanation why it does not, in eliminating the Reserve for Stabilization of Rates and Contingencies, replace it with a General Reserve of an appropriate amount as recommended by Task Force Hydro.
- (f) The proposal to recover deficits from direct industrial and retail customers in the Power District should be further studied and should not be put into effect in the meantime.
- (g) Hydro's estimates of its borrowing requirements appear to the Board to be, on the whole, reasonable and to provide a reliable basis for planning future **financing**. However,

reductions of the amounts, especially in future years, are possible if planned reserve generating capacity is reduced, as recommended by the Board.

- (h) On the whole, Hydro's financing objectives appear to be sound. With the Provincial guarantee, it seems reasonable to think that the required funds will be available in the Canadian, U.S. and other foreign markets on some terms. There are recent indications that funds may become available in a new market, the Mid-East. However, Hydro's requirements are so large that the following matters have to be carefully considered:
 - (i) the need to maintain confidence in Hydro as a self-sustaining enterprise in order to prevent impairment of the Provincial credit
 - (ii) the possibility that the Government of Ontario may require a larger proportion of the combined Government/Hydro share of the market than has been forecast

- (iii) the weakness of the evidence as to the availability of funds in the short-term and U.S. private placement markets
- (iv) the need for very close co-operation with the Ministry of Treasury, Economics and Intergovernmental Affairs in issuing and managing debt and, in the light of the large amount of U.S. and other foreign borrowings, for close attention to developments in the area of foreign exchange and balance of payments.
- (i) Hydro's policy on liquidity appears to be reasonable but it is in a development stage and deserves continuing close attention in Hydro to ensure that liquidity needs are met without incurring unnecessary costs attributable to maintaining liquidity at too high a level.

APPENDICES

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ONTARIO ENERGY BOARD

IN THE MATTER OF an investigation
by the Ontario Energy Board of
certain matters affecting or re-
lated to rates or charges by
Ontario Hydro.

BEFORE: S. W. CLARKSON, Chairman	} Tuesday, the 13th		
A. B. JACKSON, Vice-Chairman		} day of November,	
W. W. STEVENSON, Member			} 1973.
A. J. G. LEIGHTON, Member			

O R D E R

WHEREAS the Ontario Energy Board has received from the Minister of Energy a reference concerning The Hydro-Electric Power Commission of Ontario (herein referred to as Ontario Hydro), a copy of which is attached hereto as Appendix "A", made by the Minister pursuant to subsection (4) of section 37a of The Ontario Energy Board Act as amended by The Ontario Energy Board Amendment Act, 1973;

AND WHEREAS the Board is required to hold a public hearing at which it shall investigate and examine into the matters referred to it and to report thereon to the Minister;

AND WHEREAS it is expedient to make provision for the hearing and, among other things, to give directions to Ontario Hydro for the preparation of evidence and to give notice to the public as to the terms of reference and as to preparation for and date of commencement of the hearing;

IT IS ORDERED THAT:

1. The hearing shall commence at 9 a.m. on January 21, 1974, at the Huron Room in the Macdonald Block, Queen's Park, Toronto, with the submission by Ontario Hydro, after disposition by the Board of any preliminary matters of practice and procedure, of Ontario Hydro's power system expansion plans and the policies and practices affecting such plans;


2. The presentation to be made at the hearing by Ontario Hydro shall be put into writing in advance of such presentation in two separate submissions covering the two main heads set forth in the Minister's reference, and each submission shall include all the testimony and exhibits and a reasonably full opening statement outlining the various policies, practices and plans that the submission deals with and the evidence related to them;
3. Ten copies of the submission of Ontario Hydro with respect to power system expansion shall be filed with the Board on or before December 20, 1973, and a copy shall be sent at the same time to each other person who has then given notice to the Board of his intention to make a submission and, in addition, Ontario Hydro shall make copies available to the public on request at the cost of reproduction and, in addition, copies available for inspection at its head office at Toronto and at its regional offices at the cities of Barrie, Belleville, Hamilton, London, North Bay and Thunder Bay and the Borough of North York;
4. The submission of Ontario Hydro with respect to its financial policies shall be filed with the Board, sent to other persons and otherwise made available in the same manner as the submission with respect to power system expansion, but at a later date to be named by the Board after the commencement of the hearing;
5. The evidence of Ontario Hydro, prepared and made available in advance in accordance with the foregoing requirements, shall be verified at the hearing by the appropriate witnesses who shall be called for that purpose, for presentation of their evidence viva voce if so directed by the Board, and for cross-examination by counsel for the Board and upon application therefor and to the extent and in the manner the Board then permits, by other counsel;
6. A copy of this order shall be sent by the Secretary of the Board without delay to the Secretary of Ontario Hydro;

7. Ontario Hydro shall at its expense without delay cause the Notice of Hearing attached hereto as Appendix "B" (or an Italian translation for publication in Corriere Canadese and a French translation for publication in Le Droit) to be published as a display advertisement of at least two-column width in two consecutive issues of the daily newspapers listed in Appendix "C" and one issue of The Financial Post and The Ontario Gazette;

8. Where any person other than Ontario Hydro wishes to make a submission for consideration by the Board in making its report, he shall comply with the directions set forth in the said Notice of Hearing, and in default of such compliance, he shall not be heard except with leave of the Board.

DATED at Toronto this 13th day of November, 1973.

ONTARIO ENERGY BOARD



Ivy C. Fidler
Board Secretary



Office of the
Minister

Ministry of
Energy

416/965-4286

Queen's Park
Toronto Ontario

November 5, 1973

Dear Mr. Clarkison -

Ontario Hydro

Pursuant to Subsection 4 of Section 37a of The Ontario Energy Board Act, I hereby refer to the Board for investigation and examination and report the following matters affecting or related to rates or charges of Ontario Hydro, namely:

- (1) The policies and practices respecting expansion of the Ontario Hydro power system, including the Generation Development Program for the period 1977-1982 which was approved in principle by the Government in June 1973, subject to review; and
- (2) The financial policies of Ontario Hydro, together with financial objectives.

Pursuant to Subsection 6 of Section 37a of the Act, the following terms of the reference are specified for the guidance of the Board:

It is intended that the reference cover broad policy matters and that detailed study of associated issues be deferred until later hearings. In particular, the details of depreciation policies, interest and overhead allocations and power costing are not included in this initial reference.

Priority should be given to investigation of the Generation Development Program for the period 1977-1982, including a review of the following factors:

- (a) The load forecast.
- (b) Planning the new generation and bulk transmission facilities:
 - system reliability;
 - interconnection and power pooling;
 - economic analysis governing investment decisions;
 - fuel and heavy water supplies; and
 - operation and maintenance considerations.
- (c) The program for new generation and bulk transmission.

In the review of the power system expansion program, emphasis should be placed on generating facilities, but the bulk transmission system should be considered to the extent that it complements generation facilities in planning the total power system. In-depth studies of non-generation facilities, as well as peripheral matters such as pricing export and non-firm electricity sales should be excluded from review on this initial reference. Environmental matters, including the siting of power stations and transmission corridors, which are subject to review or regulation through other processes, should also be excluded.

The investigation of the financial policies should cover:

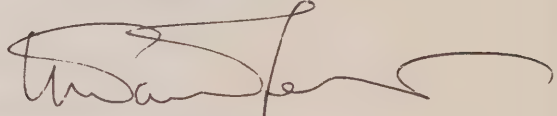
- (a) The stated financial objectives of Hydro;
- (b) Financial integrity criteria - debt/equity ratio, rate of return, interest coverages and capital availability;
- (c) Liquidity levels;
- (d) Basis for financial charges included in the cost of power; and

MR. S.W. CLARKSON

November 5, 1973

- (e) Basis for setting annual aggregate revenue requirements.

Kindest regards,

A handwritten signature in dark ink, appearing to read 'W.D. McKeough', with a long horizontal flourish extending to the right.

W.D. McKeough
Minister of Energy

Mr. S. W. Clarkson
Chairman
Ontario Energy Board
Room 432, Mowat Block
Queen's Park
Toronto, Ontario



ONTARIO ENERGY BOARD

IN THE MATTER OF an investigation
by the Ontario Energy Board of
certain matters affecting or
related to rates or charges by
Ontario Hydro.

NOTICE OF HEARING

TAKE NOTICE that, pursuant to subsection (4) of section 37a of The Ontario Energy Board Act as amended by The Ontario Energy Board Amendment Act, 1973, the Minister of Energy by a reference dated November 5th, 1973, has referred to the Ontario Energy Board for investigation and examination and report the following matters affecting or related to rates or charges of The Hydro-Electric Power Commission of Ontario (herein referred to as Ontario Hydro), namely: -

1. The policies and practices respecting expansion of the Ontario Hydro power system, including the Generation Development Program for the period 1977-1982 which was approved in principle by the Government in June 1973, subject to review; and
2. The financial policies of Ontario Hydro, together with financial objectives.

AND TAKE NOTICE that the Board will conduct a public hearing into the above-mentioned matters commencing on Monday, the 21st day of January, 1974, at 9:00 A.M., at the Huron Room in the Macdonald Block, Queen's Park, Toronto.

Copies of the reference may be obtained on request from the Secretary of the Board. It contains directions for the guidance of the Board and in accordance with such directions the Board will at this time inquire into broad policy matters, deferring detailed study of associated issues until later hearings, and will give priority to investigation of the Generation Development Program for the period 1977-1982. Environmental

matters, including the siting of power stations and transmission corridors which are or will be subject to review or regulation through other processes, are also to be excluded.

The Board has made an Order dated November 13th, 1973, providing for preparation for the hearing, and copies may be obtained on request from the Secretary of the Board. By the said Order, the Board has directed Ontario Hydro to prepare a submission in writing in the matter of power system expansion, together with all the supporting evidence it intends to present at the hearing, and to file the same with the Board on or before December 20, 1973, and to make copies available to the public on request at the cost of reproduction and copies available for inspection at its head office at Toronto and its regional offices at the cities of Barrie, Belleville, Hamilton, London, North Bay and Thunder Bay and the Borough of North York.

A copy will also be available for inspection at the offices of the Ontario Energy Board.

By the said Order of the Board, similar directions are given to Ontario Hydro regarding its submission in the matter of financial policies, but for a later date to be determined by the Board after the commencement of the hearing.

AND TAKE NOTICE that any other person wishing to make a submission to the Board is required to file personally with or send by registered mail to the Secretary of the Board at the Board offices at 790 Bay Street, Toronto, and to send to the Secretary of Ontario Hydro at 620 University Avenue, Toronto, on or before December 14, 1973, a written notice of such intention, containing a concise statement of the facts from which his interest and the nature and scope of his intended submission may be determined and the address to which communications to him should be sent. It is the intention of the Board, after giving consideration to all such notices, to give directions as to the advance filing of supporting evidence and as to the manner in

which the submissions will be received at the hearing.

DATED at Toronto this 13th day of November, 1973.

ONTARIO ENERGY BOARD



Ivy C. Fidler
Board Secretary



ONTARIO ENERGY BOARD

IN THE MATTER OF an investigation
by the Ontario Energy Board of
certain matters affecting or
related to rates or charges by
Ontario Hydro.

BEFORE:	A. B. Jackson, Vice Chairman	} Monday, the 24th day of December, 1973
	W. W. Stevenson, Member	
	A. J. G. Leighton, Member	

O R D E R

WHEREAS, pursuant to a reference from the Minister of Energy dated November 5th, 1973, the Ontario Energy Board will hold a hearing commencing at 9 a.m. on January 21st, 1974, at the Huron Room in the Macdonald Block, Queen's Park, Toronto, on the matters set forth in the reference and will deal first with the policies and practices respecting expansion of the Ontario Hydro power system;

AND WHEREAS, pursuant to directions given by the Board in its Notice of Hearing dated November 13th, 1973, Ontario Hydro has filed its submission dated December 19th, 1973 on the System Expansion Program, and other interested persons wishing to make submissions to the Board have given notice to the Board of such intention;

AND WHEREAS it is expedient to make further provision for the manner in which such interested persons shall make their submissions to the Board;

THE BOARD DOTH ORDER AND DECLARE THAT:

1. In making its Report to the Minister of Energy, the Board wishes to consider, within its terms of reference, all relevant evidence from directly interested members of the public (including individuals, corporations, associations or other groups) who have given written notice of intention to make a submission.

2. The evidence in support of any such submission to be presented to the Board shall, with respect to power system expansion policies and practices, be reduced to writing and shall be filed with the Board at its offices, Suite 910, 790 Bay Street, Toronto, no later than at the commencement of the hearing on January 21st, 1974, unless such date is enlarged by Order of the Board. The said supporting evidence shall set out in detail and not in summary form, what shall be presented to the Board by a witness or witnesses on behalf of the person making the submission. The said written evidence shall be accompanied by any charts, maps, diagrams or supporting material to be used in support of such evidence. No evidence and no material shall be heard by the Board unless so filed, unless otherwise ordered by the Board.

3. The relevant evidence in support of a submission, prefiled as aforesaid, shall be presented at an appropriate stage of the hearing by a witness or witnesses who shall be sworn and who shall give the evidence viva voce. The name of all witnesses to be called in support of a submission shall be set forth in writing and provided to the Board at the time of the prefiling of the evidence. In the case of an expert witness, qualified to give opinion evidence, his or her qualifications shall also be set forth in writing and be filed with the submission.

4. All written material to be filed with the Board shall be filed in 15 copies unless otherwise ordered by the Board, and a copy delivered to Ontario Hydro and to each other interested person who has filed a notice of submission.

5. All written material to be filed with the Board shall be identified by reference to the name of the person on whose behalf the submission is made and by the name of the witness who will present it at the hearing.

6. The Board may order further written statements of any witness to be filed with the Board upon terms.

7. All witnesses shall be subject to cross examination as the Board shall direct.

8. At the close of the evidence, submissions by way of argument may be made orally or in writing as directed by the Board, by or on behalf of each person who has given notice of intention to do so as provided for by Order of the Board.

9. At the opening of the public hearing on January 21st, 1974, and from time to time, the Board shall make such other or additional Orders as to procedure and practice, as it seems appropriate to the Board. In particular, directions will be given at a later date with regard to the preparation and presentation of evidence relating to the second part of the hearing, i.e. financial policies of Ontario Hydro.

10. The Board Secretary shall ensure that Ontario Hydro and persons who have given notice of intention to make a submission have received or will receive copies of:

(a) The Board's Order of November 13th, 1973, which includes the reference from the Minister of Energy dated November 5th, 1973, and the Notice of Hearing dated November 13th, 1973.

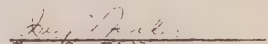
(b) Ontario Hydro's "System Expansion Program" submission of December 19, 1973.

(c) Every notice of intention filed by persons wishing to make a submission.

(d) This Order.

DATED at Toronto this 24th day of December, 1973.

ONTARIO ENERGY BOARD


Ivy C. Fidler
Board Secretary



ONTARIO ENERGY BOARD

IN THE MATTER OF an investigation
by the Ontario Energy Board of
certain matters affecting or re-
lated to rates or charges by
Ontario Hydro.

BEFORE:

A. B. Jackson, Vice Chairman	}	Tuesday, the 6th
W. W. Stevenson, Member		day of February,
A. J. G. Leighton, Member		1974.

ORDER

WHEREAS, pursuant to a reference from the Minister of Energy dated November 5, 1973, the Ontario Energy Board is presently holding a public hearing and dealing with the first phase of the reference, concerning the policies and practices respecting expansion of the Ontario Hydro power system:

AND WHEREAS it is expedient to make further provision for the manner in which the second phase of the hearing, involving the financial policies of Ontario Hydro, together with financial objectives, is to proceed;

IT IS ORDERED THAT:

1. The second phase of the hearing shall commence at 9:00 a.m. on April 1, 1974, at the Frontenac Room in the Macdonald Block, Queen's Park, Toronto, with the submission by Ontario Hydro of Ontario Hydro's financial policies together with its financial objectives.
2. Fifteen copies of the written submission that is to be presented by Ontario Hydro at the hearing, including all the testimony and exhibits and a reasonably full opening statement outlining the various policies and objectives that the submission deals with and the evidence related to them, shall be filed with the Board on or before February 28, 1974, and copies shall at

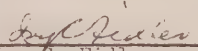
the same time be distributed and otherwise made available to interested persons in accordance with the Board's Order H.R. 1-1 dated November 13, 1973.

3. Ontario Hydro shall at its expense without delay cause the Notice of Hearing attached hereto as Appendix "A" (or an Italian translation for publication in Corriere Canadese and a French translation for publication in Le Droit) to be published as a display advertisement of at least two-column width in two consecutive issues of the daily newspapers listed in Appendix "B" and in one issue of The Financial Post. A copy, which may be of one-column width, shall also be published in The Ontario Gazette.

4. Any person who has given notice of intention to make a submission as required by Board Order H.R. 1-1 and who wishes to give evidence in support of his submission with respect to the financial policies and financial objectives of Ontario Hydro shall reduce the evidence into writing, accompanied by any charts, maps, diagrams or supporting material to be used in support of such evidence, and file 15 copies with the Board and deliver copies to Ontario Hydro and other interested persons no later than at the resumption of the hearing on April 1, 1974, unless such date is enlarged by Order of the Board. In other respects, the same directions apply as were given by the Board regarding submissions on power system expansion.

DATED at Toronto this 6th day of February, 1974.

ONTARIO ENERGY BOARD


Ivy C. Fidler
Board Secretary



ONTARIO ENERGY BOARD

RE: ONTARIO HYDRONOTICE OF RESUMED HEARING

The hearing of the Ontario Energy Board which commenced on January 21, 1974, with an inquiry into the power system expansion plans of Ontario Hydro will be resumed at 9 a.m. on Monday, April 1, 1974, at the Frontenac Room in the Macdonald Block, Queen's Park, Toronto, in order to deal with the financial policies and objectives of Ontario Hydro.

The hearing is being held pursuant to a reference from the Minister of Energy dated November 5, 1973, and in accordance with procedural Orders and directions of the Board. Copies of the reference, Orders and directions may be obtained on request from the Secretary of the Board at the offices of the Board at 14 Carlton Street, Toronto.

Ontario Hydro has been directed to prepare a written submission on its financial policies and objectives and to file it with the Board on or before February 28, 1974. Copies are being served on persons who have given notice to the Board, in accordance with the rules, of an intention to make a submission. Copies will be available for inspection by the public at the offices of the Ontario Energy Board, at the head office of Ontario Hydro at Toronto, and at its regional offices at the cities of Barrie, Belleville, Hamilton, London, North Bay and Thunder Bay and the Borough of North York. Copies may be obtained from Ontario Hydro for the cost of reproduction.

DATED at Toronto this 6th day of February, 1974.

ONTARIO ENERGY BOARD

Ivy C. Fidler
Ivy C. Fidler
Board Secretary

Dates of Hearing Sitzings*

1974

January 21-24 inclusive, 28-31 inclusive

February 4-8 inclusive, 11-15 inclusive, 18-20 inclusive,
25-28 inclusive

March 1, 4-8 inclusive, 11, 12, 20, 21

April 1, 2, 4, 5, 8-11 inclusive, 16-19 inclusive,
22-26 inclusive, 29

May 1, 21, 27

June 3

* There was one sitting per day, normally from
9.00 a.m. to 1.00 p.m. except for one additional
sitting in the evening of March 5.



Ontario
Energy
Board

14 Carlton Street
Toronto M5B 1K5
(416) 965-2851

May 21, 1974

The Honourable W. Darcy McKeough,
Minister of Energy,
Government of Ontario.

Dear Mr. McKeough:

Pursuant to your reference of November 5, 1973, made pursuant to section 37a of The Ontario Energy Board Act, the Board has held an extensive public hearing on the power system expansion plans and the financial policies of Ontario Hydro. The hearing is now finished except for completion of argument by counsel and then the presentation by Ontario Hydro of the results of studies of certain variations in its 1977-1982 Generation Development Program. The Board expects to receive the additional evidence referred to early in June and to make a final detailed report no later than the end of August.

The 1977-1982 Generation Development Program was approved in principle by the Government in June of 1973 in order that Ontario Hydro might take the steps that must be taken now in order to prevent delays in completion of the various projects. The review of the program by the Board has therefore not prevented Hydro from making the necessary commitments, but with the passage of time the increasing amounts of money so committed to any project make more expensive a change in the program affecting that project. The Board therefore thinks it appropriate to submit this interim report to you to indicate the areas where its review will not lead to any recommended change in the program and the areas where it might do so.

For reasons which will be set forth in detail in the final report, the Board is of the opinion, on the evidence before it, that the matters within the scope of the Board's inquiry show no ground for recommending that the Government withhold specific approval of the Pickering "B" and Wesleyville generating projects and the heavy water plants other than Plant "D". The Board substantially accepts Ontario Hydro's forecasted need for these projects.

With respect to Bruce "B" generating plant, the Heavy Water Plant "D" and the Bowmanville generating plant, the Board needs further time to consider the results of the studies now being made by Ontario Hydro. The review of the 1977-82 Generation

Development Program in the light of the new studies could lead to a recommendation for a deferral, which may be no more than one year, of the in-service dates for units at Bruce "B", a deferral of the Heavy Water Plant "D", and the bringing in at an early date of an additional fossil fuel generating plant in substitution for the proposed nuclear plant at Bowmanville.

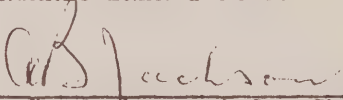
The Board, in its final report, will not question the need for Bruce "B". The Board is of the opinion that specific approval of this project by the Government will not prejudice the further review of the project by the Board, provided that the approval leaves open the question of in-service dates.

The Board's final report, which will deal with the entire 1977-82 Generation Development Program for both the East system and the West system, will contain a summary of the information and views presented to the Board together with the opinion of the Board and its reasons therefor. For the purposes of this interim report, a very brief summary is attached hereto as Appendix "A".


The Board hopes that this interim report may be of assistance to you and the Government in removing in part the questions that have existed (as a result of the Government's approval in principle only, subject to review by the Board) with regard to the initial steps being taken by Ontario Hydro to proceed with its 1977-82 Generation Development Program.

Yours very truly,

ONTARIO ENERGY BOARD


A. B. Jackson, Q.C., Chairman


W. W. Stevenson, Ph.D.


A. J. G. Leighton, P.Eng.

Summary of information and views
pertaining to interim report dated May 21, 1974
by Ontario Energy Board to the Minister of Energy

Ontario Hydro -

The Wesleyville, Pickering "B" and Bruce "B" generating stations and the heavy water plants "A", "B" and "C" are the earlier units in the Generation Development Program and there is an urgent need for them to enable Ontario Hydro to supply forecast loads with adequate reliability.

Ontario Municipal Electric Association -

Supports Ontario Hydro's position as to forecast load and reliability and also its emphasis on nuclear generation with consequent need for heavy water, but opposes lease-purchase of heavy water plant as being more costly than ownership.

Niagara Basic Power Users Committee

Suggests more gradual transition to nuclear generation, to relieve financial strain, and a more cautious approach to system expansion. Wishes Ontario Hydro to be instructed to explore alternative development programs and Board to recommend limited and qualified approval to those elements of the Development Program which must be implemented before the end of January, 1975.

Pollution Probe -

Suggests load growth should be controlled and will be less than forecast by Ontario Hydro and advocates greater degree of public participation in the planning of system expansion.

Sierra Club of Ontario -

Advocates consideration of environmental "costs" by utilities in determining their long-range policies. Questions Ontario Hydro's load forecast in view of changing conditions and questions efficiency of Ontario Hydro's facilities.

List of Consultants[a] Reports

1. G. W. Clayton, P.Eng.: Review of Ontario Hydro's Power System Expansion as presented to the Ontario Energy Board at hearing held January to June, 1974.
2. Corpus Research Services: Some Representative Large-user Electric Utility Rates and Energy Costs Per Kwh As Of June, 1974.
3. J. O. Dean: Working Paper, Phase II, Review of Ontario Hydro's Financial Policies and Objectives.
4. EBASCO Services Incorporated (R. R. Bennett):
Background Paper on Availability of Coal-fired and Nuclear Units and the Relationship of Unit Size to System Size. Emphasis is on coal-fired units regarding equivalent forced outage rate, operating maturity, design maturity, scheduled outages and derivation of outage data. February 25, 1974.
5. Edison Electric Institute: Equipment Availability, Composite Unit Summary Report 1972 for
 - Fossil units, coal fuel, generator sizes 725-775 MVA and 475-525 MVA.
 - Fossil units, gas fuel, generator size 475-525 MVA.
 - Nuclear units, nuclear fuel, generator sizes 475-525 MVA and 725-775 MVA.February 22, 1974.
6. Hedlin Menzies (R. J. Simpson): Notes on Elasticity of Demand for Electricity and Summary of Testimony Relating to Load Forecasting During the Ontario Energy Board Hearing on the Submission Expansion Program of Ontario Hydro, January 22 to February 1, 1974.

7. Hedlin Menzies (R. Warner): Working Paper, Review of Ontario Hydro's Financial Policies and Objectives.
8. PowerComp Associates Limited (R. Billington, P. Eng.): Background Paper on Power System Reliability Evaluation, including back-up publications. March 28, 1974.
9. D. W. Ross: Summary of Fuel Supply and Cost based on evidence submitted by Ontario Hydro and related to the System Expansion Program. March, 1974.
10. M. Ward, P. Eng.: Comments on Evidence Submitted by Ontario Hydro relating to Systems Expansion Program, Volumes 2, 3 and 4. January, 1974.

[b] Reviews

1. Acres Consulting Services (J. G. Warnock): discussions with the Central Electric Generating Board regarding the impact of the recent U.K. coal strike on electricity production and the national economy.
2. Coopers & Lybrand: consultations on financial practices and policies of electric utilities in the United States.
3. Major Consulting Services: review of Ontario Hydro's proposed system expansion program and advice on fossil-fired generation.
4. J. Scott Rogers, Ph.D., University of Toronto: advice on computer modelling of generation availability.
5. Wood Gundy: review of capital availability.

